MY PROJECT
BY CASA GOMES

SÉRGIO MENDES RODRIGUES GOMES

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Dados: 2023.11.29 13:38:07 Z

PROJECTO DE REDE DE DISTRIBUIÇÃO DE ÁGUAS PREDIAIS

MEMÓRIA DESCRITIVA E JUSTIFICATIVA

LICENCIAMENTO

CONSTRUÇÃO DE HOTEL "ECONATURE 4 ÁGUAS"

TAVIPESCA, LDA

ESTRADA QUATRO ÁGUAS - TAVIRA

C493

NOVEMBRO 2023

MY PROJECT
BY CASA GOMES

TERMO DE RESPONSABILIDADE DO AUTOR DO PROJECTO DE REDE DE DISTRIBUIÇÃO DE ÁGUAS PREDIAIS

Sérgio Mendes Rodrigues Gomes, Engenheiro Técnico Civil, titular do cartão de cidadão nº 11337490, contribuinte nº 201754614, com domicílio profissional na Rua Coronel Oliveira Verdades Miranda, nº 15, 2330-192 Entroncamento, inscrito na Ordem dos Engenheiros Técnicos sob o nº 2646, declara, para os efeitos do disposto no nº 1 do artigo 10º do Decreto-Lei nº 555/99, de 16 de Dezembro, na redacção que lhe foi conferida pelo Decreto-Lei nº 136/2014, de 09 de Setembro, com as alterações da Lei nº79/2017 de 18 de Agosto que, o Projecto da Rede Predial de Distribuição de Água, de que é autor, relativo à obra de **Construção de Hotel "4 águas"**, localizada na Estrada Quatro Águas, concelho de **Tavira**, cujo licenciamento foi requerido por **Tavipesca Companhia de Conservas A Tavirense, Lda**, sede na Rua Doutor Manuel Trindade n.º1, 3ºfrente, 8800-471 Tavira, observa as normas legais e regulamentos aplicáveis, designadamente o Regulamento Geral dos Sistemas Públicos e Prediais de Distribuição de Águas e de Drenagem das Águas Residuais, Decreto Regulamentar nº 23/95, de 23 de Agosto.

Entroncamento, 29 de Novembro de 2023

O Técnico,

Sérgio Mendes Rodrigues Gomes
Cartão do Cidadão nº 11337490
OET nº 2646

ÍNDICE

1. INTRODUÇÃO

A presente memória refere-se ao projecto da rede predial de distribuição de águas da obra de **Construção de Hotel "Econature 4 Águas"**, a levar a cabo na Estrada quatro águas – Tavira.

O presente projecto está de acordo com o projecto de arquitectura.

Será seguido o Regulamento Geral dos Sistemas Públicos e Prediais de Distribuição de Água e Drenagem de Águas Residuais Domésticas e Pluviais, aprovado pelo Decreto Regulamentar nº 23/95, de 23 de Agosto.

2. INSTALAÇÕES E EQUIPAMENTOS DA REDE DE DISTRIBUIÇÃO

2.1 CONSTITUIÇÃO DA REDE

A rede de distribuição de água fria e água quente será executada em tubagem multicamada tricomposto (PEAD-AL-PE-Xb) da marca "Geberit" ou equivalente, suspensa sobre tecto falso e embutida em roço nas paredes com as respectivas válvulas de seccionamento.

A distribuição de água, desde o ponto de ligação até às áreas de consumo, será efectuada por intermédio de prumadas individuais, que se desenvolvem no interior dos tectos falsos acessíveis e em roços nas paredes; serão instaladas válvulas de corte geral a cada um dos espaços de consumo. A passagem da tubagem de água para as diversas zonas de consumo posicionar-se-á, regra geral, sob os lavatórios, prevendo-se a instalação de válvulas de seccionamento, de actuação manual, de modo a colocar fora de serviço as instalações hidráulicas; as referidas válvulas possibilitam, em cenário de emergência ou avaria, a realização de trabalhos de substituição ou manutenção dos troços e componentes localizados a jusante. Nas instalações sanitárias, a distribuição de água potável recorrerá a tubagens instaladas a um nível alto, abaixo da laje do pavimento, no interior dos tectos falsos ou embebidas nas paredes, não sendo permitida a colocação de tubagens embebidas nos pavimentos.

A implantação correcta de todos os elementos ou equipamentos visíveis representados nas peças desenhadas anexas encontra-se definida no projecto de arquitectura, pelo que todos os trabalhos relacionados com os mesmos devem ser antecipadamente coordenados nesse sentido.

O traçado das tubagens e respectivos calibres encontram-se indicados nas peças desenhadas, bem como nos cálculos, onde constam a informação necessária à definição dos troços constituintes da rede predial e os dados relativos às verificações do correcto dimensionamento das tubagens a aplicar.

Nos traçados e no dimensionamento hidráulico, foram admitidas como premissas as condições de conforto necessárias e suficientes para um eficiente funcionamento da infraestrutura de distribuição de água.

Todas as indicações das peças desenhadas e escritas quanto a dimensões correspondem ao aproveitamento teórico dos espaços disponíveis, e, que por razões de óbvia prudência, deverão ser confirmadas em obra e compatibilizados com as diversas especialidades envolvidas no processo construtivo.

Este projeto contempla um sistema de aproveitamento de águas pluviais e águas cinzentas que é reciclada e conduzida pra um depósito. De seguida, a água é pressurizada e introduzida na rede dos autoclismos do hotel.

2.2 TUBAGEM, ACESSÓRIOS E ÓRGÃOS UTILIZADOS

As Condutas das Redes de Distribuição de Água serão constituídas por:

- Tubagem em Polietileno de Alta Densidade (PEAD/PN10) na rede Exterior de Distribuição de Água
- Ramal de Ligação em PVC PN10
- Tubagem Mepla tricomposto (PEAD-AL-PE-Xb) suspensa sobre tecto falso e/ou embutida em roço nas paredes, na Rede de Distribuição de Água Fria e Água Quente.

Os acessórios e órgãos a utilizar (válvulas, colectores, etc.), são os adequados para a respectiva tubagem utilizada.

Os tubos devem estar marcados com as dimensões nominais correspondentes à tabela apresentada no documento de homologação com indicações relativas ao diâmetro e à espessura; as dimensões nominais encontram-se apresentadas no Quadro 1 e no Quadro 2.

$Ø_{ext}$ (mm)	$Ø_{int}$ (mm)
16	12
20	15.4
25	20.0
32	26.0
40	32.0
50	41.0
63	51.0
75	60.0
110	90

Quadro 1 – Diâmetros de tubagem em tricomposto PEAD-AL-PE-XB PN10

$Ø_{ext}$ (mm)	$Ø_{int}$ (mm)
25	21
32	28
40	35.2
50	44
63	55.4
75	66.0
90	79.2
110	96.8
125	110.2

Quadro 2 – Diâmetros de tubagem em PEAD PE100-SDR13.6

Os acessórios, nomeadamente colectores, curvas, tês, reduções e juntas cegas, serão no material correspondente à tubagem e de acordo com o estipulado nas normas portuguesas e regulamentos em vigor. As torneiras e válvulas serão de marca homologada ou com certificado de qualidade, e serão aplicadas em todos os aparelhos.

Como forma de garantia de qualidade das instalações, só deverão ser utilizadas tubagens portadoras de certificado de ensaio realizado por entidade creditada para o efeito. No entanto, será aceitável a utilização de um outro material de características idênticas, desde que sejam verificadas as normas técnicas e os princípios de equivalência para com o material proposto.
As tubagens da rede de distribuição de água quente serão isoladas termicamente empregando-se coquilhas ou pranchas e fitas adesivas de material isolante ("Teflon", "Armstrong", ou similar). Deverão aplicar-se coquilhas com a espessura mínima de 20mm.

3. DIMENSIONAMENTO, COEFICIENTES DE SIMULTANEIDADE E CAUDAIS DE CÁLCULO

Será seguido o método prescrito no nº 4 do Artigo 91º, que tem já em conta os coeficientes de simultaneidade. Os valores deste método obtidos são mais conservadores do que os calculados por via analítica, o que permitirá assim um melhor nível de serviço.
Considerou-se, no dimensionamento da rede hidráulica, a necessidade de abastecimento aos equipamentos listados no Quadro 3, em função dos respectivos caudais de consumo individuais, os quais foram definidos de acordo com o Anexo IV do regulamento e a informação técnica dos fabricantes dos dispositivos.

	Caudal de consumo individual	
Dispositivo de consumo	Água quente (l/s)	Água fria (l/s)
Lavatório individual	0.10	0.10
Base de duche	0.15	0.15
Sanita	-	0.10
Pia Lava-louça	0.20	0.20
Máquina de lavar-roupa	0.20	0.20
Máquina de lavar-louça	0.15	0.15
Cozinha - água fria	-	0.45
Cozinha - água quente	0.45	-
Torneira de serviço	-	0.45

Quadro 3 – Caudais instantâneos relativos aos aparelhos consumidores

Dada a improbabilidade de todos os dispositivos de utilização estarem em funcionamento simultâneo, o valor do caudal acumulado, total dos caudais instantâneos dos diversos pontos de consumo, deverá ser multiplicado por um coeficiente de simultaneidade, que expressa a probabilidade do funcionamento simultâneo dos consumidores. Para a quantificação do caudal de cálculo optou-se pelo recurso ao ábaco proposto no Regulamento Geral dos Sistemas Públicos e Prediais de Distribuição de Água e Drenagem de Águas Residuais, no Anexo V. Assim, a determinação do caudal de cálculo foi baseada nas seguintes expressões numéricas:

- $Q_c = 0.5469 \cdot Q_a^{0.5137}$, para um caudal acumulado (Q_a) inferior a 3.5l/s e um nível de **conforto médio**
- $Q_c = 0.5226 \cdot Q_a^{0.5364}$, para um caudal acumulado (Q_a) superior a 3.5l/s e inferior a 25l/s, e um nível de **conforto médio**
- $Q_c = 0.2525 \cdot Q_a^{0.7587}$, para um caudal acumulado (Q_a) superior a 25l/s e inferior a 500l/s, e um nível de **conforto médio**

3.1 VELOCIDADE E PERDAS DE CARGA

A definição dos diâmetros das tubagens da rede predial foi efectuada em função dos caudais de cálculo, dos limites de velocidade escoamento e das rugosidades dos materiais na estimativa das perdas de carga. O diâmetro das tubagens foi determinado de modo que a velocidade de escoamento se situe entre os 0.5m/s e os 2.0m/s. Na presente situação, os diâmetros adoptados permitem velocidades de escoamento que cumprem o intervalo de velocidades regulamentar, com a finalidade de evitar fenómenos de cavitação e ruídos susceptíveis de ocorrer nas tubagens.

As velocidades foram verificadas através da fórmula da Continuidade:

$$V = \frac{1.273 \cdot Q}{D^2} \qquad \textbf{Eq. 1}$$

em que:

V – velocidade de escoamento (m/s)

Q – caudal (m^3/s)

D – diâmetro da secção (m)

A perda de carga foi obtida pela fórmula de Flamant:

$$J = 4 \cdot b \cdot V^{7/4} \cdot D^{-5/4} \qquad \textbf{Eq. 2}$$

em que:

J – perda de carga (m/m)
b – factor caracterizador da rugosidade do material (-), considerado igual a 0.000134 em tubagens derivadas de plástico.
V – velocidade de escoamento (m/s)
D – diâmetro da secção (m)

Para além das perdas de carga contínuas foram consideradas as perdas de carga localizadas devidas à presença de singularidades que condicionam as condições de escoamento. Para efeitos do dimensionamento hidráulico, as perdas de carga localizadas podem ser assimiladas a uma perda de carga equivalente à sofrida por atrito num determinado comprimento de canalização, majorando o comprimento real em 25% (L_{eq} = 1.25 · L_{real}). Foi igualmente contabilizada a perda de carga nos contadores.

Apresentam-se nos quadros de cálculo (ver *tabela de cálculo*) os diâmetros para os diferentes troços que compõem as redes de águas, assim como os resultados necessários para o seu conveniente dimensionamento. Todos os cálculos e dimensionamentos do presente projecto foram elaborados atendendo aos critérios estipulados no Regulamento Geral dos Sistemas Públicos e Prediais de Distribuição de Água e Drenagem de Águas Residuais, que se encontra redigido no Decreto Regulamentar n.º 23/95, de 23 de Agosto.

3.2 PRESSÃO E CONTADOR

Por motivos de conforto e de durabilidade dos materiais, a pressão de serviço em todos os dispositivos de utilização não seja inferior a 50kPa e não ultrapasse os 600kPa, satisfazendo o critério preconizado pelo Artigo 87º do Regulamento Geral dos Sistemas Públicos e Prediais de Distribuição de Água e de Drenagem de Águas Residuais, a pressão disponível à entrada da rede projectada não deverá exceder 600kPa, nem ser inferior a 300kPa, valor fornecido pela entidade gestora.

Para efeitos de cálculo foram efectuadas verificações para os aparelhos considerados "hidraulicamente mais desfavoráveis".

Os cálculos efectuados, na perspectiva da pressão obtida na rede predial, encontram-se listados nas folhas de cálculo apresentadas em anexo.

3.3 EQUIPAMENTOS DE PRODUÇÃO DE ÁGUA QUENTE SANITÁRIA

A produção de água quente sanitária é garantida através de bombas de calor, estando estas ligadas em circuitos separados, no entanto está garantida a possibilidade de os mesmos serem ligados entre si.

Na cozinha do restaurante, as águas quentes são garantidas através de termoacumulador eléctrico.

3.4 INSTALAÇÕES E EQUIPAMENTOS DE ÁGUAS PROJECTADOS

Toda a Rede de Abastecimento e Distribuição encontra-se esquematizada nas peças desenhadas, podendo este traçado sofrer pequenos ajustamentos resultantes de condicionamentos existentes no local da obra, impossíveis de prever na fase de projecto.

3.5 LIMITES DE FORNECIMENTO

Serão fornecidas todas as tubagens, acessórios e órgãos, e realizados todos os trabalhos necessários, complementares e acessórios para a correcta construção das Instalações e Equipamentos de Água, cuja constituição se apresenta no Capitulo 2.1. Constituem excepção o contador de água, relativamente ao qual se procederá exclusivamente à sua instalação e montagem, bem como dos seus órgãos de segurança, comando e controle.

3.6 VELOCIDADE DE ESCOAMENTO

De acordo com a alínea b) do nº 1 do Artigo 94º, a velocidade de escoamento deverá situar-se entre os 0,50 m/s e os 2,00 m/s, garantindo assim um melhor conforto e durabilidade das respectivas tubagens.

4. REDE DE ABASTECIMENTO DE ÁGUA PARA COMBATE A INCÊNDIO

4.1 INSTALAÇÕES E EQUIPAMENTOS DA REDE DE DISTRIBUIÇÃO

4.1.1 CONSTITUIÇÃO E DIMENSIONAMENTO

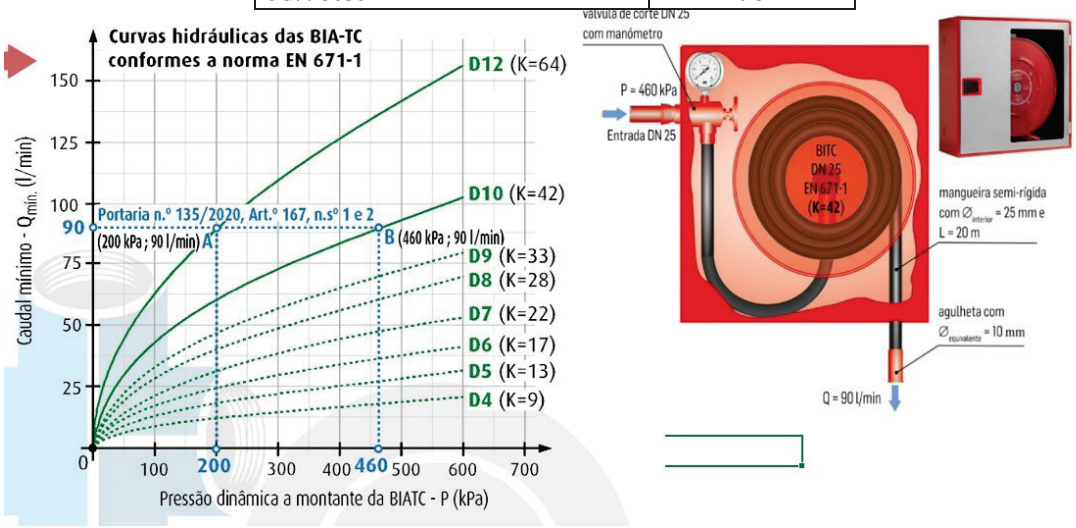
A Rede de distribuição de água para combate a Incêndio terá como objetivo o abastecimento à rede de incêndio armada (RIA) no interior (bocas-de-incêndio do tipo "carretel").

De acordo com o nº 1 do Artigo 167º e do nº 3 do Artº 171º da Portaria 1532/2008 de 29 de Dezembro, os valores dos caudais a considerar nos dispositivos de utilização, são os seguintes:

A rede de distribuição de água para combate a incêndio funcionará na sua totalidade, com ligação directa através de contador á rede publica.

A rede de alimentação das bocas-de-incêndio deve garantir, em cada boca-de-incêndio em funcionamento, com metade das bocas abertas, até um máximo exigível de quatro uma pressão dinâmica mínima de 460 kPa e um caudal instantâneo mínimo de 90 l/min para um fator de descarga K=42, tal como indicado nº 1 do Artº 167º da Portaria 1532/2008 de 29 de Dezembro e EN 671-1.

Dispositivos de Utilização	Caudais Mínimos (l/min)
Carretel	90



4.1.2 TUBAGEM, ACESSÓRIOS E ÓRGÃOS UTILIZADOS

Na materialização da rede de incêndio armada no interior do edifício propõe-se o uso de tubagens em ferro galvanizado e respectivos acessórios. Apresentam-se de seguida os diâmetros dos materiais adotados:

DN (mm)	Øint (mm)
15	16.1
20	21.7
25	27.3
32	36.0
40	41.9
50	53.1
65	68.9
80	80.9
100	105.3
125	129.7

Quadro 4 – Diâmetros de tubagem em ferro galvanizado com costura da série média.

Como forma de garantia de qualidade das instalações, só deverão ser utilizadas tubagens portadoras de certificado de ensaio realizado por entidade creditada para o efeito. No entanto, é aceitável a utilização de um outro material de características idênticas, desde que sejam verificadas as normas técnicas e princípios de equivalência para com o material proposto.

Os acessórios, nomeadamente curvas, tês, reduções e juntas cegas serão no material correspondente à tubagem e de acordo com o estipulado nas Normas Portuguesas e Regulamentos em vigor.

4.1.3 ESPECIFICAÇÕES TÉCNICAS

Os carretéis a instalar serão do tipo carretel com armário e cofre para equipamentos S.I. para montagem encastrada.

Carretel será equipado com válvula manual e manómetro para verificação de pressão. O enrolador é montado na porta que abre 180º e pode ser removido facilmente durante a instalação para facilitar a montagem.

O armário tem um cofre lateral para um extintor, uma válvula ou outro equipamento S.I.

O armário do carretel deverá possuir as dimensões 1105 x 795 x 230 mm (LxHxP) ou 695 x 1400 x 285 (LxHxP) conforme sitio a aplicar.

O carretel deverá possuir as seguintes características:

- Discos laterais em aço, pintura epóxica RAL 3001 (brilho 15)
- Válvula de abertura rápida manual 1"
- Sistema patenteado de ligação
- Agulheta jacto/nevoeiro/fechado

- Mangueira de 25mm com 25 mts, anti-abrasiva, anti-estática e semi-rígida preta, segundo a norma EN694
- Mangueira de alimentação especial
- Peças centrais em bronze
- Travão ajustável
- Dobradiças no lado direito
- Fecho com manípulo para abertura
- Orifícios de Ø35mm, 3 lados para a alimentação, pré-cortados
- Costas removíveis em aço galvanizado, podem ser usadas como bitola de montagem
- Armário, excepto costas, acabado a pintura epoxídica RAL 9010 (brilho 15)
- Sinal da porta de acordo com a Directiva do Concelho 92/58/EEC
- Instruções para uso e manutenção

O carretel deverá se testado e aprovado, com marcação CE, conforme EN671-1.

4.1.4 INSTALAÇÕES E EQUIPAMENTOS DE ÁGUAS PROJECTADOS

Toda a rede de abastecimento encontra-se esquematizada nas peças desenhadas, podendo este traçado sofrer pequenos ajustamentos resultantes de condicionamentos existentes no local da obra, impossíveis de prever na fase de projecto.

4.1.5 LIMITES DE FORNECIMENTO

Serão fornecidas todas as tubagens, acessórios e órgãos, e realizados todos os trabalhos necessários, complementares e acessórios para a correcta construção das Instalações e Equipamentos de Água.

5. OMISSÕES

5.1 MATERIAIS NÃO ESPECIFICADOS

Todos os Materiais não especificados e que tenham emprego na obra deverão satisfazer as condições técnicas de resistência e segurança impostas pelos regulamentos que lhes dizem respeito ou terem características que satisfaçam as boas normas construtivas. Poderão ser submetidos a ensaios especiais para a sua verificação, tendo em atenção o local de emprego.

Entroncamento, 29 de Novembro de 2023

O Técnico,

Sérgio Mendes Rodrigues Gomes
Cartão do Cidadão n.º 11337490
OET n.º 2646

6. ANEXOS DE CALCULOS

Rede de bocas de incêndio armadas (BIA)

O dimensionamento da rede de PCI foi realizado tendo em conta as pressões mínimas necessárias nos pontos de consumo, determinando a zona mais desfavorável da rede de acordo com a simultaneidade de utilização para os equipamentos presentes na mesma:

- Simultaneidade para bocas de incêndio armadas (BIA): **4**

O ponto de trabalho requerido para o grupo de bombagem '**A1 (Rés-do-chão)**' é:

- Pressão de saída: **6.781 bar**

- Caudal de saída: **366.9 l/min**

Verificando também que, para um caudal de saída 40% superior ao nominal, a pressão de saída do grupo é superior a 70% do ponto de trabalho calculado.

Mostra-se seguidamente a justificação do cálculo hidráulico na zona mais desfavorável para o grupo de bombagem seleccionado:

Tramo	L	Q	v	J	P_i	Δh	ΔP	P_f	Ø	DN
A1 -> A (Rés-do-chão)	2.70	366.9	1.6	6.7	6.781	2.70	0.018	6.498	68.9	2 1/2"
A -> B	2.31	366.9	1.6	6.7	6.498	--	0.015	6.482	68.9	2 1/2"
B -> O	25.16	366.9	1.6	6.7	6.482	--	0.168	6.315	68.9	2 1/2"
O -> P	22.47	366.9	1.6	6.7	6.315	--	0.150	6.165	68.9	2 1/2"
P -> Q	31.47	366.9	1.6	6.7	6.165	--	0.210	5.955	68.9	2 1/2"
Q -> R	39.77	366.9	2.7	23.7	5.955	0.27	0.942	4.986	53.1	2"
R -> S	23.37	271.8	2.0	13.7	4.986	--	0.321	4.665	53.1	2"
S -> T	31.08	179.8	1.4	6.5	4.665	--	0.202	4.464	53.1	2"
T -> U	19.99	89.8	0.7	1.8	4.464	--	0.036	4.428	53.1	2"
U -> A8	1.67	89.8	1.5	11.9	4.428	-1.67	0.020	4.572	36.0	1 1/4"
A8, Bocas de incêndio 25 mm (K = 42), (Rés-do-chão)		**89.8**						**4.572**		
T -> V	6.51	90.0	0.7	1.8	4.464	--	0.012	4.452	53.1	2"
V -> A9	1.67	90.0	1.5	11.9	4.452	-1.67	0.020	4.596	36.0	1 1/4"
A9, Bocas de incêndio 25 mm (K = 42), (Rés-do-chão)		**90.0**						**4.596**		
S -> W	0.94	92.0	1.5	11.9	4.665	--	0.011	4.654	36.0	1 1/4"
W -> A10	1.67	92.0	1.5	11.9	4.654	-1.67	0.020	4.798	36.0	1 1/4"
A10, Bocas de incêndio 25 mm (K = 42), (Rés-do-chão)		**92.0**						**4.798**		
R -> X	4.97	95.0	0.7	1.9	4.986	--	0.009	4.976	53.1	2"
X -> A11	1.67	95.0	1.5	12.6	4.976	-1.67	0.021	5.120	36.0	1 1/4"
A11, Bocas de incêndio 25 mm (K = 42), (Rés-do-chão)		**95.0**						**5.120**		

Notas:

L: Comprimento real do tramo
Q: Caudal
v: Velocidade
J: Perda de carga no tramo
P_i: Pressão de entrada ao tramo
Δh: Altura superada pelo tramo
ΔP: Queda de pressão no tramo
P_f: Pressão de saída
Ø: Diâmetro interior da tubagem
DN: Diâmetro nominal da tubagem

Rede de bocas de incêndio armadas (BIA)

O dimensionamento da rede de PCI foi realizado tendo em conta as pressões mínimas necessárias nos pontos de consumo, determinando a zona mais desfavorável da rede de acordo com a simultaneidade de utilização para os equipamentos presentes na mesma:

- Simultaneidade para bocas de incêndio armadas (BIA): **4**

O ponto de trabalho requerido para o grupo de bombagem '**A1 (Rés-do-chão)**' é:

- Pressão de saída: **6.781 bar**

- Caudal de saída: **366.9 l/min**

Verificando também que, para um caudal de saída 40% superior ao nominal, a pressão de saída do grupo é superior a 70% do ponto de trabalho calculado.

Mostra-se seguidamente a justificação do cálculo hidráulico na zona mais desfavorável para o grupo de bombagem seleccionado:

Tramo	L	Q	v	J	P_i	Δh	ΔP	P_f	Ø	DN
A1 -> A (Rés-do-chão)	2.70	392.9	1.7	7.3	6.781	2.70	0.020	6.496	68.9	2 1/2"
A -> B	2.31	392.9	1.7	7.3	6.496	--	0.017	6.479	68.9	2 1/2"
B -> C	14.04	106.0	0.5	0.6	6.479	--	0.009	6.470	68.9	2 1/2"
C -> E	31.50	106.0	0.5	0.6	6.470	--	0.020	6.450	68.9	2 1/2"
E -> G	12.15	106.0	0.8	2.3	6.450	--	0.028	6.422	53.1	2"
G -> H	13.11	106.0	0.8	2.3	6.422	0.27	0.030	6.366	53.1	2"
H -> J	30.12	106.0	0.8	2.3	6.366	--	0.069	6.297	53.1	2"
J -> L	26.49	106.0	0.8	2.3	6.297	--	0.060	6.237	53.1	2"
L -> A6	1.67	106.0	1.7	15.1	6.237	-1.67	0.025	6.376	36.0	1 1/4"
A6, Bocas de incêndio 25 mm (K = 42), (Rés-do-chão)		**106.0**						**6.376**		
B -> O	25.16	286.9	1.2	4.1	6.479	--	0.103	6.376	68.9	2 1/2"
O -> P	22.47	286.9	1.2	4.1	6.376	--	0.092	6.283	68.9	2 1/2"
P -> Q	31.47	286.9	1.2	4.1	6.283	--	0.129	6.154	68.9	2 1/2"
Q -> R	39.77	286.9	2.1	14.6	6.154	0.27	0.581	5.546	53.1	2"
R -> S	23.37	286.9	2.1	14.6	5.546	--	0.341	5.205	53.1	2"
S -> T	31.08	189.9	1.4	6.8	5.205	--	0.213	4.992	53.1	2"
T -> U	19.99	94.8	0.7	1.9	4.992	--	0.038	4.954	53.1	2"
U -> A8	1.67	94.8	1.5	12.6	4.954	-1.67	0.021	5.097	36.0	1 1/4"
A8, Bocas de incêndio 25 mm (K = 42), (Rés-do-chão)		**94.8**						**5.097**		
T -> V	6.51	95.1	0.7	1.9	4.992	--	0.012	4.980	53.1	2"
V -> A9	1.67	95.1	1.5	12.6	4.980	-1.67	0.021	5.123	36.0	1 1/4"
A9, Bocas de incêndio 25 mm (K = 42), (Rés-do-chão)		**95.1**						**5.123**		
S -> W	0.94	97.0	1.5	12.9	5.205	--	0.012	5.193	36.0	1 1/4"
W -> A10	1.67	97.0	1.5	12.9	5.193	-1.67	0.022	5.335	36.0	1 1/4"
A10, Bocas de incêndio 25 mm (K = 42), (Rés-do-chão)		**97.0**						**5.335**		

Tramo	L	Q	v	J	P_i	Δh	ΔP	P_f	Ø	DN

Notas:

L: Comprimento real do tramo
Q: Caudal
v: Velocidade
J: Perda de carga no tramo
P_i: Pressão de entrada ao tramo
Δh: Altura superada pelo tramo
ΔP: Queda de pressão no tramo
P_f: Pressão de saída
Ø: Diâmetro interior da tubagem
DN: Diâmetro nominal da tubagem

Ponto de ligação à rede pública		
Referência	Q (l/s)	P (mca)
PL1	6.18	32

Contador			
Referência	Pressão á entrada (mca)	J (mca)	n
DN 50	31.38	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
Ramal de Ligação	10.92	13.104	47.55	0.13	6.18	0.53	96.8	Ø110	0.84	0.007	32	31.38	-3	20	20	-	-
TH2	5.259	6.311	47.55	0.13	6.18	-1.05	96.8	Ø110	0.84	0.007	26.88	27.88	-3	20	20	-	-
TH3	5.71	6.852	43.25	0.12	5.1	3.25	90	Ø110	0.8	0.007	27.88	24.59	-2.36	20	20	-	-
TH4	4.464	5.357	37.25	0.14	5.1	0	90	Ø110	0.8	0.007	24.59	24.55	-2.36	20	20	-	-
TH5	1.073	1.288	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	24.55	24.51	-0.69	20	20	-	-
TH6	6.371	7.645	0.1	1.00	0.1	-2.45	12	Ø16	0.88	0.103	24.51	26.17	-0.45	20	20	-	-
TH7	0.159	0.191	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	26.17	26.15	-0.44	20	20	-	-
TH8	0.734	0.881	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	25.15	24.86	-0.44	20	20	-	-
TH9	6.515	7.818	0.1	1.00	0.1	-2.45	12	Ø16	0.88	0.103	24.51	26.16	-0.45	20	20	-	-
TH10	0.272	0.327	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	26.16	26.12	-0.44	20	20	-	-
TH11	1.057	1.269	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	25.12	24.79	-0.44	20	20	-	-
TH12	53.697	64.437	37.05	0.14	5.1	0	90	Ø110	0.8	0.007	24.55	24.09	-2.36	20	20	-	-
TH13	2.398	2.878	0.8	0.66	0.53	0	26	Ø32	0.99	0.048	24.09	23.95	-0.86	20	20	-	-
TH14	3.014	3.617	0.5	0.80	0.4	-2.45	26	Ø32	0.76	0.03	23.95	26.3	-0.86	20	20	-	-
TH15	0.488	0.585	0.5	0.80	0.4	0	26	Ø32	0.76	0.03	26.3	26.28	-0.86	20	20	-	-
TH16	0.538	0.646	0.5	0.77	0.38	0	26	Ø32	0.72	0.027	25.28	25.26	-0.86	20	20	-	-
TH17	0.462	0.555	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	25.26	25.01	-0.44	20	20	-	-
TH18	1.326	1.591	0.4	0.85	0.34	0	26	Ø32	0.64	0.022	25.26	25.23	-0.86	20	20	-	-
TH19	0.478	0.574	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	25.23	24.97	-0.44	20	20	-	-
TH20	1.326	1.591	0.3	1.00	0.3	0	20	Ø25	0.95	0.062	25.23	25.13	-0.68	20	20	-	-
TH21	0.679	0.815	0.15	1.00	0.15	0.4	15.5	Ø20	0.79	0.062	25.13	24.68	-0.55	20	20	-	-
TH22	1.532	1.839	0.15	1.00	0.15	0.4	15.5	Ø20	0.79	0.062	25.13	24.62	-0.55	20	20	-	-
TH23	2.471	2.965	0.3	0.99	0.3	0	20	Ø25	0.95	0.061	23.95	23.77	-0.68	20	20	-	-
TH24	3.482	4.178	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	23.77	25.84	-0.44	20	20	-	-
TH25	0.774	0.929	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.84	24.5	-0.44	20	20	-	-
TH26	8.401	10.081	0.2	1.00	0.2	-2.5	20	Ø25	0.64	0.03	23.77	25.97	-0.68	20	20	-	-
TH27	0.11	0.132	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	25.97	25.96	-0.68	20	20	-	-
TH28	0.249	0.299	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	24.96	24.95	-0.68	20	20	-	-
TH29	0.575	0.69	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.95	24.63	-0.44	20	20	-	-
TH30	1.862	2.234	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.95	24.48	-0.44	20	20	-	-
TH31	8.015	9.618	36.25	0.14	5.01	0	90	Ø110	0.79	0.007	24.09	24.03	-2.34	20	20	-	-
TH32	4.464	5.357	0.3	1.00	0.3	-2.45	20	Ø25	0.95	0.062	24.03	26.14	-0.68	20	20	-	-
TH33	0.77	0.924	0.3	1.00	0.3	0	20	Ø25	0.95	0.062	26.14	26.09	-0.68	20	20	-	-
TH34	0.467	0.561	0.3	1.00	0.3	0	20	Ø25	0.95	0.062	25.09	25.05	-0.68	20	20	-	-
TH35	4.144	4.973	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	25.05	24.34	-0.44	20	20	-	-
TH36	0.904	1.084	0.2	1.00	0.2	0.7	20	Ø25	0.64	0.03	25.05	24.32	-0.68	20	20	-	-
TH37	49.943	59.932	35.95	0.14	4.98	0	90	Ø110	0.78	0.007	24.03	23.62	-2.34	20	20	-	-

Tubagens																		
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ert} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
Cinz38	5.546	6.655	7.1	0.21	1.5	-2.75	55.4	Ø63	0.62	0.008	23.62	26.32	-1.77	20	20	-	-
Cinz39	4.75	5.7	7.1	0.21	1.5	4.75	55.4	Ø63	0.62	0.008	2	-2.8	-1.76	20	20	-	-
Cinz40	7.37	8.844	7.1	0.21	1.5	-2.75	55.4	Ø63	0.62	0.008	-2.8	-0.12	-1.76	20	20	-	-
Cinz41	5.221	6.266	7.1	0.21	1.5	2.8	55.4	Ø63	0.62	0.008	23.07	20.22	-1.75	20	20	-	-
Cinz42	1	1.2	6.2	0.22	1.39	0	51	Ø63	0.68	0.011	20.22	20.21	-1.49	20	20	-	-
Cinz43	5.849	7.019	4.4	0.26	1.16	0	41	Ø50	0.88	0.022	20.21	20.06	-1.25	20	20	-	-
Cinz44	10.679	12.815	4.3	0.27	1.14	0	41	Ø50	0.87	0.021	20.06	19.79	-1.25	20	20	-	-
Cinz45	8.809	10.571	4.2	0.27	1.13	0	41	Ø50	0.85	0.021	19.79	19.57	-1.24	20	20	-	-
Cinz46	6.088	7.306	4.1	0.27	1.11	0	41	Ø50	0.84	0.02	19.57	19.42	-1.24	20	20	-	-
Cinz47	0.103	0.123	3.9	0.28	1.08	0	41	Ø50	0.82	0.019	19.42	19.42	-1.23	20	20	-	-
Cinz48	5.805	6.966	3.9	0.28	1.08	0	41	Ø50	0.82	0.019	19.42	19.28	-1.23	20	20	-	-
Cinz49	7.505	9.006	3.8	0.28	1.07	0	41	Ø50	0.81	0.019	19.28	19.11	-1.23	20	20	-	-
Cinz50	3.137	3.764	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	19.11	18.88	-0.66	20	20	-	-
Cinz51	3.403	4.084	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	18.88	18.76	-0.66	20	20.1	-	-
Cinz52	11.238	13.486	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	18.76	19.88	-0.43	20.1	20.1	-	-
Cinz53	2.677	3.213	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	18.88	18.35	-0.42	20.1	20.1	-	-
Cinz54	3.101	3.721	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	18.76	18.38	-0.43	20.1	20.1	-	-
Cinz55	2.441	2.929	0.1	1.00	0.1	-2.441	12	Ø16	0.88	0.103	18.38	20.52	-0.43	20.1	20.1	-	-
Cinz56	0.879	1.055	0.1	1.00	0.1	0.141	12	Ø16	0.88	0.102	19.52	19.27	-0.42	20.1	20.1	-	-
Cinz57	4.231	5.078	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	18.88	20.86	-0.43	20	20.1	-	-
Cinz58	0.955	1.146	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	19.86	19.55	-0.43	20.1	20.1	-	-
Cinz59	3.381	4.057	3.5	0.30	1.04	0	41	Ø50	0.79	0.018	19.11	19.04	-1.23	20	20	-	-
Cinz60	4.114	4.937	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	19.04	21.03	-0.43	20	20.1	-	-
Cinz61	6.734	8.081	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	20.03	19	-0.43	20.1	20.1	-	-
Cinz62	10.251	12.301	3.4	0.30	1.03	0	41	Ø50	0.78	0.018	19.04	18.82	-1.23	20	20.1	-	-
Cinz63	3.101	3.721	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	18.82	18.44	-0.43	20.1	20.1	-	-
Cinz64	2.441	2.929	0.1	1.00	0.1	-2.441	12	Ø16	0.88	0.103	18.44	20.58	-0.43	20.1	20.1	-	-
Cinz65	0.879	1.055	0.1	1.00	0.1	0.141	12	Ø16	0.88	0.102	19.58	19.33	-0.42	20.1	20.1	-	-
Cinz66	3.419	4.103	3.3	0.31	1.01	0	41	Ø50	0.76	0.017	18.82	18.75	-1.22	20.1	20.1	-	-
Cinz67	6.416	7.699	3.2	0.31	0.99	0	41	Ø50	0.75	0.017	18.75	18.62	-1.22	20.1	20.1	-	-
Cinz68	0.078	0.094	3.2	0.31	0.99	0	41	Ø50	0.75	0.017	18.62	18.62	-1.22	20.1	20.1	-	-
Cinz69	4.114	4.937	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	18.62	20.61	-0.43	20.1	20.1	-	-
Cinz70	6.838	8.206	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	19.61	18.57	-0.42	20.1	20.1	-	-
Cinz71	5.373	6.447	3.1	0.32	0.98	0	41	Ø50	0.74	0.016	18.62	18.52	-1.22	20.1	20.1	-	-
Cinz72	0.159	0.191	3.1	0.32	0.98	0	41	Ø50	0.74	0.016	18.52	18.51	-1.21	20.1	20.1	-	-
Cinz73	3.125	3.75	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	18.51	18.13	-0.42	20.1	20.1	-	-
Cinz74	2.441	2.929	0.1	1.00	0.1	-2.441	12	Ø16	0.88	0.102	18.13	20.27	-0.42	20.1	20.1	-	-
Cinz75	0.879	1.055	0.1	1.00	0.1	0.141	12	Ø16	0.88	0.102	19.27	19.02	-0.42	20.1	20.1	-	-
Cinz76	10.241	12.29	3	0.32	0.96	0	41	Ø50	0.73	0.016	18.51	18.32	-1.21	20.1	20.1	-	-
Cinz77	4.38	5.256	2.9	0.33	0.95	0	41	Ø50	0.72	0.015	18.32	18.24	-1.21	20.1	20.1	-	-
Cinz78	4.186	5.023	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	18.24	20.23	-0.42	20.1	20.1	-	-
Cinz79	3.242	3.89	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	19.23	18.63	-0.42	20.1	20.1	-	-
Cinz80	5.45	6.54	2.8	0.33	0.93	0	41	Ø50	0.7	0.015	18.24	18.15	-1.2	20.1	20.1	-	-
Cinz81	0.086	0.103	2.8	0.33	0.93	0	41	Ø50	0.7	0.015	18.15	18.14	-1.2	20.1	20.1	-	-
Cinz82	10.27	12.324	2.7	0.34	0.91	0	41	Ø50	0.69	0.014	18.14	17.97	-1.2	20.1	20.1	-	-
Cinz83	4.227	5.072	0.1	1.00	0.1	-2.55	12	Ø16	0.88	0.102	17.97	20	-0.42	20.1	20.1	-	-
Cinz84	6.882	8.259	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	19	17.9	-0.42	20.1	20.1	-	-
Cinz85	3.396	4.075	2.6	0.34	0.89	0	41	Ø50	0.68	0.014	17.97	17.91	-1.2	20.1	20.1	-	-
Cinz86	3.83	4.596	2.2	0.37	0.82	0	41	Ø50	0.62	0.012	17.91	17.86	-1.19	20.1	20.1	-	-
Cinz87	7.641	9.169	2.1	0.38	0.8	0	32	Ø40	1	0.037	17.86	17.52	-0.97	20.1	20.1	-	-
Cinz88	2.462	2.955	2	0.39	0.78	0	32	Ø40	0.97	0.035	17.52	17.41	-0.97	20.1	20.1	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
Cinz89	0.067	0.08	2	0.39	0.78	0	32	Ø40	0.97	0.035	17.41	17.41	-0.96	20.1	20.1	-	-
Cinz90	4.088	4.906	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	17.41	19.41	-0.42	20.1	20.1	-	-
Cinz91	0.123	0.147	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	19.41	19.39	-0.41	20.1	20.1	-	-
Cinz92	1.636	1.964	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	18.39	18.19	-0.41	20.1	20.1	-	-
Cinz93	0.3	0.36	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	18.19	17.95	-0.41	20.1	20.1	-	-
Cinz94	7.507	9.009	1.9	0.40	0.76	0	32	Ø40	0.95	0.034	17.41	17.11	-0.96	20.1	20.1	-	-
Cinz95	5.538	6.646	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	17.11	18.93	-0.41	20.1	20.1	-	-
Cinz96	0.126	0.152	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	18.93	18.91	-0.41	20.1	20.1	-	-
Cinz97	4.111	4.933	0.1	1.00	0.1	0.217	12	Ø16	0.88	0.102	17.91	17.19	-0.41	20.1	20.1	-	-
Cinz98	0.168	0.202	1.8	0.41	0.74	0	32	Ø40	0.92	0.032	17.11	17.1	-0.96	20.1	20.1	-	-
Cinz99	5.552	6.663	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	17.1	18.92	-0.41	20.1	20.1	-	-
Cinz100	0.126	0.152	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	18.92	18.9	-0.41	20.1	20.1	-	-
Cinz101	4.095	4.914	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	17.9	17.2	-0.41	20.1	20.1	-	-
Cinz102	5.952	7.143	1.7	0.42	0.72	0	32	Ø40	0.89	0.031	17.1	16.88	-0.96	20.1	20.1	-	-
Cinz103	4.075	4.89	1.6	0.44	0.7	0	32	Ø40	0.87	0.029	16.88	16.74	-0.96	20.1	20.1	-	-
Cinz104	5.818	6.981	1.5	0.45	0.67	0	32	Ø40	0.84	0.027	16.74	16.55	-0.96	20.1	20.1	-	-
Cinz105	6.712	8.055	1.4	0.46	0.65	0	32	Ø40	0.81	0.026	16.55	16.34	-0.95	20.1	20.1	-	-
Cinz106	4.316	5.179	0.1	1.00	0.1	-2.55	12	Ø16	0.88	0.102	16.34	18.36	-0.41	20.1	20.1	-	-
Cinz107	1.9	2.28	0.1	1.00	0.1	0.265	12	Ø16	0.88	0.102	17.36	16.86	-0.41	20.1	20.1	-	-
Cinz108	0.917	1.1	1.3	0.48	0.63	0	32	Ø40	0.78	0.024	16.34	16.32	-0.95	20.1	20.1	-	-
Cinz109	6.778	8.133	0.5	0.77	0.38	0	26	Ø32	0.72	0.027	16.32	16.1	-0.79	20.1	20.1	-	-
Cinz110	5.538	6.646	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	16.1	17.92	-0.41	20.1	20.1	-	-
Cinz111	0.126	0.152	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	17.92	17.9	-0.4	20.1	20.1	-	-
Cinz112	4.111	4.933	0.1	1.00	0.1	0.217	12	Ø16	0.88	0.102	16.9	16.18	-0.4	20.1	20.1	-	-
Cinz113	0.491	0.589	0.4	0.85	0.34	0	26	Ø32	0.64	0.022	16.1	16.08	-0.78	20.1	20.1	-	-
Cinz114	0.971	1.165	0.4	0.85	0.34	0	26	Ø32	0.64	0.022	16.08	16.06	-0.78	20.1	20.1	-	-
Cinz115	1.224	1.468	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	16.06	15.97	-0.62	20.1	20.1	-	-
Cinz116	4.537	5.444	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	15.97	15.81	-0.62	20.1	20.1	-	-
Cinz117	3.627	4.353	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	15.81	17.86	-0.4	20.1	20.1	-	-
Cinz118	0.283	0.34	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	17.86	17.82	-0.4	20.1	20.1	-	-
Cinz119	5.801	6.961	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	16.82	15.91	-0.4	20.1	20.1	-	-
Cinz120	14.452	17.342	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	15.81	16.53	-0.4	20.1	20.1	-	-
Cinz121	2.601	3.121	0.1	1.00	0.1	0.208	12	Ø16	0.88	0.102	15.53	15	-0.39	20.1	20.1	-	-
Cinz122	3.86	4.632	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	15.97	18	-0.41	20.1	20.1	-	-
Cinz123	6.013	7.216	0.1	1.00	0.1	0.219	12	Ø16	0.88	0.102	17	16.04	-0.4	20.1	20.1	-	-
Cinz124	13.549	16.259	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	16.06	16.89	-0.41	20.1	20.1	-	-
Cinz125	0.183	0.22	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	16.89	16.87	-0.4	20.1	20.1	-	-
Cinz126	0.898	1.078	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	15.87	15.56	-0.4	20.1	20.1	-	-
Cinz127	15.843	19.012	0.8	0.61	0.49	0	26	Ø32	0.92	0.042	16.32	15.53	-0.79	20.1	20.1	-	-
Cinz128	6.505	7.806	0.3	0.98	0.29	-2.5	20	Ø25	0.94	0.06	15.53	17.56	-0.62	20.1	20.1	-	-
Cinz129	0.077	0.093	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	17.56	17.56	-0.62	20.1	20.1	-	-
Cinz130	0.074	0.088	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	16.56	16.55	-0.62	20.1	20.1	-	-
Cinz131	1.838	2.206	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	16.55	16.42	-0.62	20.1	20.1	-	-
Cinz132	0.286	0.343	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	16.42	16.18	-0.4	20.1	20.1	-	-
Cinz133	2.013	2.415	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	16.42	16.35	-0.62	20.1	20.1	-	-
TH134	0.295	0.354	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	16.35	16.11	-0.4	20.1	20.1	-	-
Cinz135	5.019	6.023	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	16.35	15.53	-0.4	20.1	20.1	-	-
Cinz136	7.069	8.483	0.5	0.77	0.38	-2.5	26	Ø32	0.72	0.027	15.53	17.8	-0.78	20.1	20.1	-	-
Cinz137	0.106	0.127	0.5	0.77	0.38	0	26	Ø32	0.72	0.027	17.8	17.79	-0.78	20.1	20.1	-	-
Cinz138	1.776	2.131	0.5	0.77	0.38	0	26	Ø32	0.72	0.027	16.79	16.74	-0.78	20.1	20.1	-	-
Cinz139	1.954	2.345	0.4	0.85	0.34	0	26	Ø32	0.64	0.022	16.74	16.68	-0.78	20.1	20.1	-	-

Tubagens																	
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ert} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
Cinz140	0.253	0.304	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	16.68	16.45	-0.4	20.1	20.1	-	-
Cinz141	4.865	5.838	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	16.68	16.34	-0.62	20.1	20.1	-	-
Cinz142	0.277	0.333	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	16.34	16.1	-0.4	20.1	20.1	-	-
Cinz143	0.672	0.807	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	16.34	16.31	-0.61	20.1	20.1	-	-
Cinz144	0.794	0.953	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	16.31	16.01	-0.4	20.1	20.1	-	-
Cinz145	2.929	3.515	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	16.31	15.75	-0.4	20.1	20.1	-	-
Cinz146	0.253	0.304	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	16.74	16.51	-0.4	20.1	20.1	-	-
Cinz147	4.375	5.25	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	16.55	18.51	-0.41	20.1	20.1	-	-
Cinz148	3.688	4.426	0.1	1.00	0.1	0.232	12	Ø16	0.88	0.102	17.51	16.83	-0.41	20.1	20.1	-	-
Cinz149	5.552	6.663	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	16.74	18.56	-0.41	20.1	20.1	-	-
Cinz150	0.126	0.152	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	18.56	18.54	-0.41	20.1	20.1	-	-
Cinz151	4.105	4.926	0.1	1.00	0.1	0.21	12	Ø16	0.88	0.102	17.54	16.83	-0.41	20.1	20.1	-	-
Cinz152	4.089	4.907	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	16.88	18.88	-0.41	20.1	20.1	-	-
Cinz153	0.113	0.136	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	18.88	18.86	-0.41	20.1	20.1	-	-
Cinz154	0.088	0.105	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	17.86	17.85	-0.41	20.1	20.1	-	-
Cinz155	3.72	4.464	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	17.85	17.2	-0.41	20.1	20.1	-	-
Cinz156	5.538	6.646	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	17.52	19.34	-0.42	20.1	20.1	-	-
Cinz157	0.126	0.152	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	19.34	19.32	-0.41	20.1	20.1	-	-
Cinz158	4.111	4.933	0.1	1.00	0.1	0.217	12	Ø16	0.88	0.102	18.32	17.6	-0.41	20.1	20.1	-	-
Cinz159	4.088	4.906	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.102	17.86	19.86	-0.42	20.1	20.1	-	-
Cinz160	0.123	0.147	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	19.86	19.84	-0.41	20.1	20.1	-	-
Cinz161	1.636	1.964	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	18.84	18.64	-0.41	20.1	20.1	-	-
Cinz162	0.3	0.36	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	18.64	18.4	-0.41	20.1	20.1	-	-
Cinz163	3.182	3.818	0.4	0.85	0.34	0	26	Ø32	0.64	0.022	17.91	17.83	-0.81	20.1	20.1	-	-
Cinz164	6.035	7.243	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	17.83	17.39	-0.64	20.1	20.1	-	-
Cinz165	8.324	9.989	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	17.39	17.09	-0.64	20.1	20.1	-	-
Cinz166	13.331	15.997	0.1	1.00	0.1	-2.55	12	Ø16	0.88	0.102	17.09	18	-0.41	20.1	20.1	-	-
Cinz167	0.138	0.166	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	18	17.99	-0.4	20.1	20.1	-	-
Cinz168	5.785	6.942	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	16.99	16.02	-0.4	20.1	20.1	-	-
Cinz169	3.788	4.545	0.1	1.00	0.1	-2.6	12	Ø16	0.88	0.102	17.09	19.23	-0.41	20.1	20.1	-	-
Cinz170	0.067	0.08	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	19.23	19.22	-0.41	20.1	20.1	-	-
Cinz171	3.692	4.431	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.102	18.22	17.46	-0.41	20.1	20.1	-	-
Cinz172	3.704	4.445	0.1	1.00	0.1	-2.55	12	Ø16	0.88	0.102	17.39	19.49	-0.41	20.1	20.1	-	-
Cinz173	0.255	0.306	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	19.49	19.46	-0.41	20.1	20.1	-	-
Cinz174	3.708	4.449	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	18.46	17.75	-0.41	20.1	20.1	-	-
Cinz175	5.247	6.297	0.1	1.00	0.1	-2.55	12	Ø16	0.88	0.102	17.83	19.73	-0.42	20.1	20.1	-	-
Cinz176	3.661	4.394	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	18.73	18.03	-0.41	20.1	20.1	-	-
Cinz177	3.125	3.75	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	18.14	17.76	-0.42	20.1	20.1	-	-
Cinz178	2.441	2.929	0.1	1.00	0.1	-2.441	12	Ø16	0.88	0.102	17.76	19.9	-0.42	20.1	20.1	-	-
Cinz179	0.879	1.055	0.1	1.00	0.1	0.141	12	Ø16	0.88	0.102	18.9	18.65	-0.42	20.1	20.1	-	-
Cinz180	4.227	5.072	0.1	1.00	0.1	-2.55	12	Ø16	0.88	0.102	18.32	20.35	-0.42	20.1	20.1	-	-
Cinz181	6.883	8.259	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	19.35	18.25	-0.42	20.1	20.1	-	-
Cinz182	5.186	6.223	0.1	1.00	0.1	-2.3	12	Ø16	0.88	0.103	18.75	20.41	-0.43	20.1	20.1	-	-
Cinz183	3.867	4.64	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	19.28	21.3	-0.43	20	20.1	-	-
Cinz184	3.611	4.333	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	20.3	19.66	-0.43	20.1	20.1	-	-
Cinz185	2.559	3.07	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	19.42	19.32	-0.66	20	20	-	-
Cinz186	2.5	3	0.2	1.00	0.2	-2.5	20	Ø25	0.64	0.03	19.32	21.73	-0.66	20	20	-	-
Cinz187	0.206	0.247	0.1	1.00	0.1	-0.05	12	Ø16	0.88	0.103	21.73	21.76	-0.43	20	20	-	-
Cinz188	4.103	4.924	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	20.76	20	-0.43	20	20.1	-	-
Cinz189	0.34	0.408	0.1	1.00	0.1	-0.1	12	Ø16	0.88	0.103	21.73	21.79	-0.43	20	20	-	-
Cinz190	4.107	4.929	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.103	20.79	19.99	-0.43	20	20.1	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
Cinz191	3.966	4.759	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	19.57	21.58	-0.43	20	20	-	-
Cinz192	3.402	4.083	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	20.58	19.96	-0.43	20	20.1	-	-
Cinz193	3.95	4.74	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	19.79	21.8	-0.43	20	20	-	-
Cinz194	5.879	7.055	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	20.8	19.88	-0.43	20	20.1	-	-
Cinz195	3.81	4.572	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	20.06	22.09	-0.44	20	20	-	-
Cinz196	6.145	7.374	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	21.09	20.13	-0.43	20	20	-	-
Cinz197	54.114	64.937	1.8	1.00	1.8	0	51	Ø63	0.88	0.017	20.21	19.12	-1.49	20	20	-	-
Cinz198	4.091	4.909	0.2	1.00	0.2	-2.5	20	Ø25	0.64	0.03	19.12	21.47	-0.66	20	20.1	-	-
Cinz199	0.234	0.281	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	21.47	21.46	-0.66	20.1	20.1	-	-
Cinz200	0.195	0.234	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	20.46	20.46	-0.66	20.1	20.1	-	-
Cinz201	8.659	10.39	0.2	1.00	0.2	2.5	20	Ø25	0.64	0.03	20.46	17.64	-0.66	20.1	20.1	-	-
Cinz202	2.379	2.855	0.1	1.00	0.1	-2.3	12	Ø16	0.88	0.103	17.64	19.65	-0.42	20.1	20.1	-	-
Cinz203	3.887	4.664	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	17.64	17.16	-0.42	20.1	20.1	-	-
Cinz204	2.3	2.76	0.1	1.00	0.1	-2.3	12	Ø16	0.88	0.102	17.16	19.18	-0.42	20.1	20.1	-	-
Cinz205	7.751	9.301	1.6	0.44	0.7	0	32	Ø40	0.87	0.029	19.12	18.85	-1	20	20	-	-
Cinz206	30.015	36.018	0.8	0.61	0.49	0	26	Ø32	0.92	0.042	18.85	17.36	-0.83	20	20.1	-	-
Cinz207	18.031	21.637	0.4	0.85	0.34	0	26	Ø32	0.64	0.022	17.36	16.88	-0.81	20.1	20.1	-	-
Cinz208	4.04	4.848	0.2	1.00	0.2	-2.5	20	Ø25	0.64	0.03	16.88	19.23	-0.64	20.1	20.1	-	-
Cinz209	3.364	4.036	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	18.23	18.11	-0.63	20.1	20.1	-	-
Cinz210	0.317	0.381	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	18.11	17.87	-0.41	20.1	20.1	-	-
Cinz211	5.206	6.248	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	18.11	17.27	-0.41	20.1	20.1	-	-
Cinz212	14.898	17.878	0.2	1.00	0.2	-2.5	20	Ø25	0.64	0.03	16.88	18.83	-0.64	20.1	20.1	-	-
Cinz213	0.263	0.316	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	18.83	18.6	-0.41	20.1	20.1	-	-
Cinz214	5.25	6.3	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	18.83	17.99	-0.41	20.1	20.1	-	-
Cinz215	25.704	30.844	0.4	0.85	0.34	0	26	Ø32	0.64	0.022	17.36	16.67	-0.81	20.1	20.1	-	-
Cinz216	6.245	7.494	0.2	1.00	0.2	-2.5	20	Ø25	0.64	0.03	16.67	18.94	-0.63	20.1	20.1	-	-
Cinz217	0.106	0.128	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	18.94	18.94	-0.63	20.1	20.1	-	-
Cinz218	0.078	0.093	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	17.94	17.94	-0.63	20.1	20.1	-	-
Cinz219	5.503	6.604	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	17.94	17.74	-0.63	20.1	20.1	-	-
Cinz220	2.592	3.111	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	17.74	17.42	-0.41	20.1	20.1	-	-
Cinz221	0.361	0.434	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	17.42	17.17	-0.4	20.1	20.1	-	-
Cinz222	0.351	0.422	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	17.74	17.49	-0.41	20.1	20.1	-	-
Cinz223	6.402	7.682	0.2	1.00	0.2	-2.5	20	Ø25	0.64	0.03	16.67	18.94	-0.63	20.1	20.1	-	-
Cinz224	0.071	0.086	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	17.94	17.94	-0.63	20.1	20.1	-	-
Cinz225	5.456	6.547	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	17.94	17.74	-0.63	20.1	20.1	-	-
Cinz226	2.86	3.431	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	17.74	17.19	-0.41	20.1	20.1	-	-
Cinz227	0.289	0.347	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	17.74	17.5	-0.41	20.1	20.1	-	-
Cinz228	2.932	3.518	0.8	0.61	0.49	-0.05	26	Ø32	0.92	0.042	18.85	18.76	-0.83	20	20.1	-	-
Cinz229	3.229	3.875	0.2	1.00	0.2	-2.45	20	Ø25	0.64	0.03	18.76	21.09	-0.66	20.1	20.1	-	-
Cinz230	14.42	17.304	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	20.09	19.56	-0.66	20.1	20.1	-	-
Cinz231	0.286	0.343	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	19.56	19.33	-0.42	20.1	20.1	-	-
Cinz232	1.119	1.343	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	19.56	19.23	-0.42	20.1	20.1	-	-
Cinz233	2.792	3.35	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	18.76	18.65	-0.83	20.1	20.1	-	-
Cinz234	0.558	0.669	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	18.65	18.58	-0.43	20.1	20.1	-	-
Cinz235	2.45	2.94	0.1	1.00	0.1	-2.45	12	Ø16	0.88	0.103	18.58	20.73	-0.43	20.1	20.1	-	-
Cinz236	0.266	0.319	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	20.73	20.7	-0.43	20.1	20.1	-	-
Cinz237	3.699	4.439	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	19.7	19.24	-0.43	20.1	20.1	-	-
Cinz238	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	19.24	19.02	-0.42	20.1	20.1	-	-
Cinz239	7.877	9.453	0.5	0.77	0.38	-2.45	26	Ø32	0.72	0.027	18.65	20.84	-0.82	20.1	20.1	-	-
Cinz240	2.251	2.701	0.5	0.77	0.38	0	26	Ø32	0.72	0.027	19.84	19.77	-0.82	20.1	20.1	-	-
Cinz241	1.019	1.222	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	19.77	19.44	-0.42	20.1	20.1	-	-

Tubagens																	
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ert} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
Cinz242	4.335	5.202	0.4	0.85	0.34	0	26	Ø32	0.64	0.022	19.77	19.65	-0.82	20.1	20.1	-	-
Cinz243	2.143	2.572	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	19.65	19.5	-0.65	20.1	20.1	-	-
Cinz244	3.773	4.528	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	19.5	19.36	-0.65	20.1	20.1	-	-
Cinz245	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	19.36	19.14	-0.42	20.1	20.1	-	-
Cinz246	1.067	1.28	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	19.36	19.03	-0.42	20.1	20.1	-	-
Cinz247	0.095	0.114	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	19.5	19.49	-0.42	20.1	20.1	-	-
Cinz248	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	19.49	19.26	-0.42	20.1	20.1	-	-
Cinz249	0.104	0.124	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	19.65	19.64	-0.42	20.1	20.1	-	-
Cinz250	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	19.64	19.42	-0.42	20.1	20.1	-	-
Cinz251	7.126	8.552	0.9	0.58	0.52	0	26	Ø32	0.98	0.046	20.22	19.83	-0.84	20	20	-	-
Cinz252	1.023	1.228	0.8	0.61	0.49	0	26	Ø32	0.92	0.042	19.83	19.78	-0.84	20	20	-	-
Cinz253	2.013	2.415	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	19.78	19.53	-0.44	20	20	-	-
Cinz254	2.687	3.225	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	19.53	21.7	-0.43	20	20	-	-
Cinz255	3.729	4.474	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	20.7	20.04	-0.43	20	20	-	-
Cinz256	2.348	2.817	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	19.78	19.67	-0.84	20	20	-	-
Cinz257	3.527	4.232	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	19.67	21.74	-0.43	20	20	-	-
Cinz258	2.988	3.585	0.1	1.00	0.1	0.204	12	Ø16	0.88	0.103	20.74	20.17	-0.43	20	20	-	-
Cinz259	5.325	6.39	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	19.67	19.47	-0.84	20	20	-	-
Cinz260	4.4	5.28	0.1	1.00	0.1	-2.068	12	Ø16	0.88	0.103	19.47	21	-0.43	20	20	-	-
Cinz261	0.432	0.518	0.1	1.00	0.1	-0.432	12	Ø16	0.88	0.103	20	20.37	-0.43	20	20	-	-
Cinz262	0.931	1.118	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	20.37	20.06	-0.43	20	20	-	-
Cinz263	8.5	10.2	0.5	0.77	0.38	0	26	Ø32	0.72	0.027	19.47	19.19	-0.84	20	20	-	-
Cinz264	3.358	4.03	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	19.19	21.28	-0.43	20	20.1	-	-
Cinz265	0.169	0.202	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	21.28	21.26	-0.43	20.1	20.1	-	-
Cinz266	4.592	5.511	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	20.26	19.49	-0.43	20.1	20.1	-	-
Cinz267	9.058	10.869	0.4	0.85	0.34	0	26	Ø32	0.64	0.022	19.19	18.95	-0.83	20	20.1	-	-
Cinz268	0.86	1.032	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	18.95	18.85	-0.43	20.1	20.1	-	-
Cinz269	2.721	3.266	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	18.85	21.01	-0.43	20.1	20.1	-	-
Cinz270	1.866	2.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	20.01	19.58	-0.42	20.1	20.1	-	-
Cinz271	7.593	9.112	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	18.95	18.41	-0.66	20.1	20.1	-	-
Cinz272	4.733	5.679	0.2	1.00	0.2	-2.5	20	Ø25	0.64	0.03	18.41	20.73	-0.65	20.1	20.1	-	-
Cinz273	0.109	0.13	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	20.73	20.72	-0.42	20.1	20.1	-	-
Cinz274	3.953	4.744	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	19.72	19.04	-0.42	20.1	20.1	-	-
Cinz275	0.355	0.426	0.1	1.00	0.1	-0.1	12	Ø16	0.88	0.102	20.73	20.79	-0.42	20.1	20.1	-	-
Cinz276	4.044	4.853	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.102	19.79	18.99	-0.42	20.1	20.1	-	-
Cinz277	9.478	11.374	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	18.41	19.74	-0.42	20.1	20.1	-	-
Cinz278	3.606	4.328	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	18.74	18.1	-0.42	20.1	20.1	-	-
Cinz279	8.672	10.406	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.103	19.83	21.26	-0.44	20	20	-	-
Cinz280	0.341	0.409	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	21.26	21.22	-0.43	20	20	-	-
Cinz281	3.423	4.107	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	20.22	19.6	-0.43	20	20.1	-	-
TH282	3.336	4.003	28.85	0.15	4.2	0	90	Ø110	0.66	0.005	23.62	23.6	-2.32	20	20	-	-
TH283	0.293	0.352	27.25	0.15	4.02	0	73	Ø90	0.96	0.013	23.6	23.59	-1.98	20	20	-	-
TH284	8.534	10.241	4.3	0.32	1.37	0	51	Ø63	0.67	0.01	23.59	23.49	-1.5	20	20	-	-
TH285	8.823	10.588	0.55	0.73	0.4	-2.5	26	Ø32	0.76	0.03	23.49	25.67	-0.85	20	20	-	-
TH286	0.174	0.208	0.55	0.73	0.4	0	26	Ø32	0.76	0.03	25.67	25.67	-0.84	20	20	-	-
TH287	0.181	0.217	0.55	0.73	0.4	0	26	Ø32	0.76	0.03	24.67	24.66	-0.84	20	20	-	-
TH288	1.01	1.212	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	24.66	24.63	-0.84	20	20	-	-
TH289	1.053	1.264	0.35	1.00	0.35	0	26	Ø32	0.66	0.023	24.63	24.6	-0.84	20	20	-	-
TH290	0.218	0.262	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.6	24.43	-0.44	20	20	-	-
TH291	3.452	4.142	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	24.6	24.17	-0.67	20	20	-	-
TH292	0.37	0.444	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.63	24.34	-0.44	20	20	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH293	0.317	0.38	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.66	24.37	-0.44	20	20	-	-
TH294	0.901	1.081	3.75	0.34	1.27	0	41	Ø50	0.96	0.026	23.49	23.46	-1.26	20	20	-	-
TH295	3.023	3.628	0.55	0.77	0.42	-2.243	26	Ø32	0.8	0.033	23.46	25.59	-0.85	20	20	-	-
TH296	0.257	0.309	0.55	0.73	0.4	-0.257	26	Ø32	0.76	0.03	24.59	24.83	-0.85	20	20	-	-
TH297	0.54	0.648	0.55	0.73	0.4	0	26	Ø32	0.76	0.03	24.83	24.81	-0.85	20	20	-	-
TH298	1.164	1.397	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	24.81	24.78	-0.85	20	20	-	-
TH299	0.922	1.106	0.35	1.00	0.35	0	26	Ø32	0.66	0.023	24.78	24.75	-0.85	20	20	-	-
TH300	1.504	1.804	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	24.75	24.42	-0.67	20	20	-	-
TH301	0.385	0.462	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.75	24.46	-0.44	20	20	-	-
TH302	0.385	0.462	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.78	24.48	-0.44	20	20	-	-
TH303	0.276	0.331	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.81	24.63	-0.44	20	20	-	-
TH304	2.343	2.811	3.2	0.32	1.03	0	41	Ø50	0.78	0.018	23.46	23.41	-1.26	20	20	-	-
TH305	3.259	3.91	0.7	0.65	0.46	-2.45	26	Ø32	0.86	0.037	23.41	25.72	-0.85	20	20	-	-
TH306	0.129	0.155	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	24.72	24.71	-0.85	20	20	-	-
TH307	0.283	0.34	0.55	0.73	0.4	0	26	Ø32	0.76	0.03	24.71	24.7	-0.85	20	20	-	-
TH308	1.197	1.436	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	24.7	24.67	-0.85	20	20	-	-
TH309	4.8	5.76	0.35	1.00	0.35	0	26	Ø32	0.66	0.023	24.67	24.53	-0.84	20	20	-	-
TH310	0.299	0.359	0.1	1.00	0.1	0.1	12	Ø16	0.88	0.103	24.53	24.4	-0.44	20	20	-	-
TH311	2.5	3	0.25	1.00	0.25	2.5	20	Ø25	0.8	0.045	24.53	21.9	-0.67	20	20	-	-
TH312	6.356	7.628	0.25	1.00	0.25	-2.5	20	Ø25	0.8	0.045	21.9	24.06	-0.67	20	20	-	-
TH313	0.2	0.24	0.25	1.00	0.25	0.2	20	Ø25	0.8	0.045	24.06	23.85	-0.66	20	20	-	-
TH314	0.625	0.75	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	24.67	24.39	-0.44	20	20	-	-
TH315	0.625	0.75	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	24.7	24.42	-0.44	20	20	-	-
TH316	2.5	3	0.15	1.00	0.15	2.5	15.5	Ø20	0.79	0.062	24.71	22.03	-0.54	20	20	-	-
TH317	2.411	2.893	0.15	1.00	0.15	0	15.5	Ø20	0.79	0.062	22.03	21.85	-0.54	20	20	-	-
TH318	2.5	3	0.15	1.00	0.15	-2.5	15.5	Ø20	0.79	0.062	21.85	24.16	-0.54	20	20	-	-
TH319	2.283	2.74	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.062	24.16	22.29	-0.54	20	20	-	-
TH320	5.38	6.456	2.5	0.41	1.03	0	41	Ø50	0.78	0.018	23.41	23.3	-1.25	20	20	-	-
TH321	4.563	5.476	0.45	0.84	0.38	-2.45	26	Ø32	0.71	0.026	23.3	25.6	-0.85	20	20	-	-
TH322	0.318	0.382	0.45	0.84	0.38	0	26	Ø32	0.71	0.026	25.6	25.59	-0.84	20	20	-	-
TH323	0.076	0.091	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	24.59	24.59	-0.84	20	20	-	-
TH324	0.173	0.207	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	24.59	24.59	-0.84	20	20	-	-
TH325	0.929	1.114	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.59	24.54	-0.67	20	20	-	-
TH326	0.248	0.298	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	24.54	24.31	-0.44	20	20	-	-
TH327	1.106	1.327	0.15	1.00	0.15	0	15.5	Ø20	0.79	0.062	24.54	24.45	-0.54	20	20	-	-
TH328	1.7	2.04	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.062	24.45	22.63	-0.54	20	20	-	-
TH329	0.248	0.297	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	24.59	24.36	-0.44	20	20	-	-
TH330	4.271	5.125	0.1	1.00	0.1	0.1	12	Ø16	0.88	0.103	24.59	23.96	-0.44	20	20	-	-
TH331	8.573	10.287	2.05	0.45	0.91	0	41	Ø50	0.69	0.014	23.3	23.15	-1.25	20	20	-	-
TH332	3.252	3.902	0.7	0.70	0.49	-2.45	26	Ø32	0.92	0.042	23.15	25.44	-0.84	20	20	-	-
TH333	0.125	0.15	0.7	0.70	0.49	0	26	Ø32	0.92	0.042	25.44	25.43	-0.84	20	20	-	-
TH334	0.206	0.247	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	24.43	24.42	-0.84	20	20	-	-
TH335	0.099	0.118	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	24.42	24.42	-0.84	20	20	-	-
TH336	0.026	0.032	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	24.42	24.42	-0.44	20	20	-	-
TH337	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	24.42	24.19	-0.44	20	20	-	-
TH338	0.77	0.923	0.5	0.80	0.4	0	26	Ø32	0.75	0.029	24.42	24.39	-0.84	20	20	-	-
TH339	0.013	0.016	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	24.39	24.39	-0.44	20	20	-	-
TH340	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	24.39	24.17	-0.44	20	20	-	-
TH341	3.123	3.748	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	24.39	24.28	-0.84	20	20	-	-
TH342	1.875	2.249	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.062	24.28	22.44	-0.54	20	20	-	-
TH343	4.324	5.189	0.25	1.00	0.25	-0.3	20	Ø25	0.8	0.045	24.28	24.35	-0.67	20	20	-	-

Tubagens																		
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ert} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH344	0.5	0.6	0.25	1.00	0.25	0.5	20	Ø25	0.8	0.045	24.35	23.82	-0.66	20	20	-	-
TH345	1.933	2.32	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	24.42	24.18	-0.44	20	20	-	-
TH346	0.1	0.12	0.1	1.00	0.1	0.1	12	Ø16	0.88	0.103	24.18	24.07	-0.43	20	20	-	-
TH347	8.542	10.251	1.35	0.53	0.72	0	32	Ø40	0.89	0.03	23.15	22.84	-1.01	20	20	-	-
TH348	2.928	3.513	0.45	0.84	0.38	-2.309	26	Ø32	0.71	0.026	22.84	25.05	-0.84	20	20	-	-
TH349	0.191	0.229	0.45	0.81	0.36	-0.191	26	Ø32	0.68	0.025	24.05	24.24	-0.84	20	20	-	-
TH350	0.087	0.104	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	24.24	24.24	-0.84	20	20	-	-
TH351	0.635	0.763	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	24.24	24.21	-0.67	20	20	-	-
TH352	1.403	1.684	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.21	23.79	-0.43	20	20	-	-
TH353	0.386	0.464	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.21	23.92	-0.43	20	20	-	-
TH354	0.498	0.597	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.24	24.21	-0.67	20	20	-	-
TH355	0.248	0.297	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.21	24.03	-0.43	20	20	-	-
TH356	5.082	6.099	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.21	22.09	-0.54	20	20	-	-
TH357	8.706	10.447	0.9	0.63	0.57	0	32	Ø40	0.7	0.02	22.84	22.63	-1.01	20	20	-	-
TH358	2.5	3	0.45	0.84	0.38	-2.5	26	Ø32	0.71	0.026	22.63	25.05	-0.83	20	20	-	-
TH359	0.147	0.176	0.45	0.84	0.38	0	26	Ø32	0.71	0.026	25.05	25.05	-0.83	20	20	-	-
TH360	0.376	0.451	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	24.05	24.03	-0.83	20	20	-	-
TH361	1.117	1.341	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	24.03	24.01	-0.83	20	20	-	-
TH362	0.919	1.103	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.01	23.96	-0.66	20	20	-	-
TH363	0.301	0.361	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.96	23.67	-0.43	20	20	-	-
TH364	2.966	3.559	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.96	21.99	-0.53	20	20	-	-
TH365	0.276	0.331	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.01	23.72	-0.43	20	20	-	-
TH366	0.193	0.231	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.03	23.86	-0.43	20	20	-	-
TH367	2.758	3.309	0.45	0.84	0.38	-2.5	26	Ø32	0.71	0.026	22.63	25.04	-0.83	20	20	-	-
TH368	0.033	0.04	0.45	0.84	0.38	0	26	Ø32	0.71	0.026	25.04	25.04	-0.83	20	20	-	-
TH369	0.192	0.23	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	24.04	24.04	-0.83	20	20	-	-
TH370	1.126	1.351	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	24.04	24.01	-0.83	20	20	-	-
TH371	0.925	1.111	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.01	23.96	-0.66	20	20	-	-
TH372	2.973	3.568	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.96	21.99	-0.53	20	20	-	-
TH373	0.314	0.377	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.96	23.67	-0.43	20	20	-	-
TH374	0.323	0.387	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.01	23.72	-0.43	20	20	-	-
TH375	0.206	0.247	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.04	23.86	-0.43	20	20	-	-
TH376	5.725	6.87	22.95	0.16	3.67	0	73	Ø90	0.88	0.011	23.59	23.52	-1.98	20	20	-	-
TH377	3.407	4.088	0.7	0.70	0.49	-2.5	26	Ø32	0.92	0.042	23.52	25.85	-0.85	20	20	-	-
TH378	0.112	0.134	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	24.85	24.85	-0.85	20	20	-	-
TH379	0.533	0.64	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.85	24.53	-0.44	20	20	-	-
TH380	0.298	0.357	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	24.85	24.83	-0.85	20	20	-	-
TH381	0.788	0.946	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	24.83	24.81	-0.68	20	20	-	-
TH382	1.041	1.249	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	24.81	24.68	-0.44	20	20	-	-
TH383	0.512	0.614	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.68	24.46	-0.44	20	20	-	-
TH384	0.541	0.65	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.81	24.49	-0.44	20	20	-	-
TH385	4.571	5.485	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	24.83	24.67	-0.85	20	20	-	-
TH386	1.863	2.236	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.67	22.79	-0.54	20	20	-	-
TH387	4.31	5.172	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	24.67	24.19	-0.67	20	20	-	-
TH388	10.564	12.677	22.25	0.13	2.88	0	73	Ø90	0.69	0.007	23.52	23.43	-1.98	20	20	-	-
TH389	3.362	4.035	0.7	0.65	0.46	-2.5	26	Ø32	0.86	0.037	23.43	25.78	-0.85	20	20	-	-
TH390	0.153	0.183	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	25.78	25.78	-0.85	20	20	-	-
TH391	0.096	0.115	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	24.78	24.77	-0.85	20	20	-	-
TH392	0.391	0.469	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	24.77	24.75	-0.67	20	20	-	-
TH393	0.746	0.895	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	24.75	24.72	-0.67	20	20	-	-
TH394	1.329	1.595	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	24.72	24.55	-0.44	20	20	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH395	0.267	0.32	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.55	24.37	-0.44	20	20	-	-
TH396	0.482	0.579	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.72	24.41	-0.44	20	20	-	-
TH397	0.499	0.599	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.75	24.43	-0.44	20	20	-	-
TH398	2.993	3.592	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	24.77	24.67	-0.85	20	20	-	-
TH399	2.782	3.339	0.25	1.00	0.25	-0.25	20	Ø25	0.8	0.045	24.67	24.77	-0.67	20	20	-	-
TH400	2.418	2.902	0.25	1.00	0.25	0.5	20	Ø25	0.8	0.045	24.77	24.14	-0.67	20	20	-	-
TH401	1.856	2.228	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.67	22.78	-0.54	20	20	-	-
TH402	8.758	10.51	21.55	0.13	2.88	0	73	Ø90	0.69	0.007	23.43	23.36	-1.97	20	20	-	-
TH403	3.296	3.955	0.45	0.81	0.36	-2.5	26	Ø32	0.68	0.025	23.36	25.76	-0.85	20	20	-	-
TH404	0.399	0.478	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	25.76	25.75	-0.84	20	20	-	-
TH405	1.017	1.22	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	25.75	25.73	-0.84	20	20	-	-
TH406	1.076	1.291	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	25.73	25.67	-0.67	20	20	-	-
TH407	3.488	4.186	0.15	1.00	0.15	0	15.5	Ø20	0.79	0.062	25.67	25.41	-0.54	20	20	-	-
TH408	2.006	2.407	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	25.41	23.51	-0.54	20	20	-	-
TH409	0.332	0.398	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	25.67	25.48	-0.44	20	20	-	-
TH410	0.412	0.494	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	25.73	25.43	-0.44	20	20	-	-
TH411	0.432	0.518	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	25.75	25.45	-0.44	20	20	-	-
TH412	6.134	7.361	21.1	0.14	2.88	0	73	Ø90	0.69	0.007	23.36	23.31	-1.97	20	20	-	-
TH413	6.054	7.264	20.2	0.14	2.88	0	73	Ø90	0.69	0.007	23.31	23.26	-1.97	20	20	-	-
TH414	3.344	4.013	0.45	0.81	0.36	-2.5	26	Ø32	0.68	0.025	23.26	25.66	-0.84	20	20	-	-
TH415	0.104	0.125	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	25.66	25.66	-0.84	20	20	-	-
TH416	0.171	0.205	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	24.66	24.65	-0.84	20	20	-	-
TH417	1.025	1.23	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	24.65	24.63	-0.84	20	20	-	-
TH418	1.075	1.29	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.63	24.57	-0.67	20	20	-	-
TH419	3.465	4.159	0.15	1.00	0.15	0	15.5	Ø20	0.79	0.062	24.57	24.31	-0.54	20	20	-	-
TH420	1.939	2.326	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.31	22.42	-0.54	20	20	-	-
TH421	0.308	0.37	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.57	24.38	-0.44	20	20	-	-
TH422	0.433	0.519	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.63	24.32	-0.44	20	20	-	-
TH423	0.414	0.497	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.65	24.35	-0.44	20	20	-	-
TH424	7.276	8.731	19.75	0.15	2.88	0	73	Ø90	0.69	0.007	23.26	23.2	-1.96	20	20	-	-
TH425	3.354	4.024	2.3	0.42	0.98	0	41	Ø50	0.74	0.016	23.2	23.13	-1.25	20	20	-	-
TH426	3.375	4.05	1.6	0.49	0.79	0	32	Ø40	0.98	0.036	23.13	22.99	-1.01	20	20	-	-
TH427	1.461	1.754	1.15	0.57	0.65	0	32	Ø40	0.81	0.026	22.99	22.94	-1.01	20	20	-	-
TH428	8.232	9.879	0.45	0.84	0.38	-2.5	26	Ø32	0.71	0.026	22.94	25.18	-0.84	20	20	-	-
TH429	0.196	0.235	0.45	0.84	0.38	0	26	Ø32	0.71	0.026	25.18	25.17	-0.83	20	20	-	-
TH430	0.319	0.382	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	24.17	24.16	-0.83	20	20	-	-
TH431	1.009	1.211	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	24.16	24.14	-0.83	20	20	-	-
TH432	1.049	1.259	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.14	24.08	-0.66	20	20	-	-
TH433	5.277	6.332	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.08	21.94	-0.53	20	20.1	-	-
TH434	0.333	0.399	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.08	23.89	-0.43	20	20	-	-
TH435	0.443	0.531	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.14	23.83	-0.43	20	20	-	-
TH436	0.443	0.531	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.16	23.86	-0.43	20	20	-	-
TH437	9.518	11.421	0.7	0.70	0.49	-2.5	26	Ø32	0.92	0.042	22.94	24.96	-0.84	20	20	-	-
TH438	0.324	0.388	0.7	0.70	0.49	0	26	Ø32	0.92	0.042	24.96	24.95	-0.84	20	20	-	-
TH439	0.186	0.224	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	23.95	23.94	-0.83	20	20	-	-
TH440	1.716	2.059	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	23.94	23.87	-0.83	20	20	-	-
TH441	0.755	0.906	0.5	0.80	0.4	0	26	Ø32	0.75	0.029	23.87	23.85	-0.83	20	20	-	-
TH442	3.235	3.882	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	23.85	23.73	-0.83	20	20	-	-
TH443	1.837	2.204	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.73	21.85	-0.53	20	20	-	-
TH444	2.872	3.447	0.25	1.00	0.25	-0.25	20	Ø25	0.8	0.045	23.73	23.83	-0.66	20	20	-	-
TH445	2.481	2.977	0.25	1.00	0.25	0.5	20	Ø25	0.8	0.045	23.83	23.2	-0.66	20	20.1	-	-

Tubagens																		
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ert} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH446	0.365	0.438	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.85	23.55	-0.43	20	20	-	-
TH447	0.354	0.425	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.87	23.58	-0.43	20	20	-	-
TH448	0.23	0.276	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.94	23.76	-0.43	20	20	-	-
TH449	5.717	6.861	0.45	0.84	0.38	-2.355	26	Ø32	0.71	0.026	22.99	25.16	-0.84	20	20	-	-
TH450	0.145	0.174	0.45	0.81	0.36	-0.145	26	Ø32	0.68	0.025	24.16	24.3	-0.84	20	20	-	-
TH451	0.152	0.183	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	24.3	24.28	-0.43	20	20	-	-
TH452	3.873	4.647	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.28	23.65	-0.43	20	20	-	-
TH453	0.465	0.558	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	24.3	24.29	-0.84	20	20	-	-
TH454	0.396	0.475	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.29	23.99	-0.43	20	20	-	-
TH455	0.937	1.125	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.29	24.24	-0.67	20	20	-	-
TH456	0.387	0.464	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.24	23.94	-0.43	20	20	-	-
TH457	2.988	3.586	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.24	22.27	-0.54	20	20	-	-
TH458	4.314	5.177	0.7	0.70	0.49	-2.5	26	Ø32	0.92	0.042	23.13	25.42	-0.84	20	20	-	-
TH459	0.085	0.102	0.6	0.74	0.45	0	26	Ø32	0.84	0.036	25.42	25.41	-0.84	20	20	-	-
TH460	0.258	0.309	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	24.41	24.4	-0.84	20	20	-	-
TH461	0.263	0.315	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.4	24.12	-0.43	20	20	-	-
TH462	1.221	1.465	0.5	0.80	0.4	0	26	Ø32	0.75	0.029	24.4	24.36	-0.84	20	20	-	-
TH463	0.269	0.323	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.36	24.08	-0.43	20	20	-	-
TH464	3.108	3.73	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	24.36	24.25	-0.84	20	20	-	-
TH465	1.82	2.184	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.25	22.37	-0.54	20	20	-	-
TH466	2.815	3.378	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	24.25	23.85	-0.67	20	20	-	-
TH467	4.483	5.38	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	25.42	24.71	-0.43	20	20	-	-
TH468	2.95	3.54	17.45	0.16	2.88	0	73	Ø90	0.69	0.007	23.2	23.17	-1.96	20	20	-	-
TH469	6.194	7.432	16.75	0.17	2.88	0	73	Ø90	0.69	0.007	23.17	23.12	-1.96	20	20	-	-
TH470	4.299	5.159	15.15	0.19	2.88	0	73	Ø90	0.69	0.007	23.12	23.08	-1.96	20	20	-	-
TH471	5.717	6.861	0.45	0.84	0.38	-2.355	26	Ø32	0.71	0.026	23.08	25.26	-0.84	20	20	-	-
TH472	0.145	0.174	0.45	0.81	0.36	-0.145	26	Ø32	0.68	0.025	24.26	24.4	-0.84	20	20	-	-
TH473	0.152	0.183	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	24.4	24.38	-0.43	20	20	-	-
TH474	3.873	4.647	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.38	23.75	-0.43	20	20	-	-
TH475	0.465	0.558	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	24.4	24.39	-0.84	20	20	-	-
TH476	0.396	0.475	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.39	24.09	-0.43	20	20	-	-
TH477	0.937	1.125	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.39	24.34	-0.67	20	20	-	-
TH478	0.387	0.464	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.34	24.04	-0.43	20	20	-	-
TH479	2.988	3.586	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.34	22.37	-0.54	20	20	-	-
TH480	3.391	4.07	14.7	0.19	2.83	0	73	Ø90	0.68	0.007	23.08	23.06	-1.96	20	20	-	-
TH481	4.314	5.177	0.7	0.70	0.49	-2.5	26	Ø32	0.92	0.042	23.06	25.34	-0.84	20	20	-	-
TH482	0.085	0.102	0.6	0.74	0.45	0	26	Ø32	0.84	0.036	25.34	25.34	-0.84	20	20	-	-
TH483	0.258	0.309	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	24.34	24.33	-0.84	20	20	-	-
TH484	0.263	0.315	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.33	24.05	-0.43	20	20	-	-
TH485	1.221	1.465	0.5	0.80	0.4	0	26	Ø32	0.75	0.029	24.33	24.29	-0.84	20	20	-	-
TH486	0.269	0.323	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.29	24	-0.43	20	20	-	-
TH487	3.089	3.707	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	24.29	24.18	-0.84	20	20	-	-
TH488	0.019	0.023	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.18	24.18	-0.66	20	20	-	-
TH489	2.815	3.378	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	24.18	23.77	-0.66	20	20	-	-
TH490	1.815	2.178	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.18	22.29	-0.54	20	20	-	-
TH491	4.483	5.38	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	25.34	24.64	-0.43	20	20	-	-
TH492	6.28	7.537	14	0.20	2.75	0	60	Ø75	0.97	0.016	23.06	22.93	-1.68	20	20	-	-
TH493	4.049	4.858	0.7	0.70	0.49	-2.328	26	Ø32	0.92	0.042	22.93	25.06	-0.84	20	20	-	-
TH494	0.172	0.207	0.7	0.65	0.46	-0.172	26	Ø32	0.86	0.037	24.06	24.22	-0.84	20	20	-	-
TH495	2.418	2.901	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	24.22	24.14	-0.84	20	20	-	-
TH496	1.832	2.199	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.14	22.25	-0.54	20	20	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH497	4.993	5.992	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	24.14	23.62	-0.66	20	20	-	-
TH498	0.816	0.979	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	24.22	24.17	-0.67	20	20	-	-
TH499	0.401	0.482	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.17	23.87	-0.43	20	20	-	-
TH500	1.209	1.451	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	24.17	24.12	-0.67	20	20	-	-
TH501	1.526	1.832	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.12	23.78	-0.43	20	20	-	-
TH502	0.401	0.482	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.12	23.82	-0.43	20	20	-	-
TH503	5.547	6.656	13.3	0.20	2.67	0	60	Ø75	0.94	0.016	22.93	22.83	-1.68	20	20	-	-
TH504	5.742	6.89	0.45	0.84	0.38	-2.355	26	Ø32	0.71	0.026	22.83	25	-0.84	20	20	-	-
TH505	0.145	0.174	0.45	0.81	0.36	-0.145	26	Ø32	0.68	0.025	24	24.14	-0.83	20	20	-	-
TH506	0.265	0.318	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	24.14	24.14	-0.83	20	20	-	-
TH507	0.937	1.125	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.14	24.09	-0.66	20	20	-	-
TH508	0.386	0.463	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.09	23.79	-0.43	20	20	-	-
TH509	2.989	3.586	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.09	22.12	-0.53	20	20	-	-
TH510	0.397	0.476	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.14	23.84	-0.43	20	20	-	-
TH511	0.152	0.183	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	24.14	24.13	-0.43	20	20	-	-
TH512	4.076	4.891	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.13	23.47	-0.43	20	20	-	-
TH513	10.467	12.561	12.85	0.20	2.61	0	66	Ø75	0.76	0.009	22.83	22.71	-2.04	20	20	-	-
TH514	4.293	5.151	0.7	0.70	0.49	-2.5	26	Ø32	0.92	0.042	22.71	25	-0.84	20	20	-	-
TH515	0.154	0.185	0.7	0.70	0.49	0	26	Ø32	0.92	0.042	25	24.99	-0.83	20	20	-	-
TH516	0.186	0.223	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	23.99	23.98	-0.83	20	20	-	-
TH517	0.189	0.226	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	23.98	23.97	-0.66	20	20	-	-
TH518	0.792	0.95	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	23.97	23.94	-0.66	20	20	-	-
TH519	1.883	2.26	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.94	23.56	-0.43	20	20	-	-
TH520	0.292	0.351	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.94	23.65	-0.43	20	20	-	-
TH521	0.292	0.351	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.97	23.68	-0.43	20	20	-	-
TH522	3.139	3.766	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	23.98	23.87	-0.83	20	20	-	-
TH523	1.856	2.227	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.87	21.98	-0.53	20	20	-	-
TH524	2.9	3.48	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	23.87	23.47	-0.66	20	20	-	-
TH525	4.325	5.19	12.15	0.21	2.53	0	66	Ø75	0.74	0.009	22.71	22.67	-2.04	20	20	-	-
TH526	4.209	5.051	0.7	0.70	0.49	-2.55	26	Ø32	0.92	0.042	22.67	25.01	-0.83	20	20	-	-
TH527	0.11	0.132	0.7	0.70	0.49	0	26	Ø32	0.92	0.042	25.01	25	-0.83	20	20	-	-
TH528	0.14	0.168	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	24	23.99	-0.83	20	20	-	-
TH529	6.814	8.177	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	23.99	22.96	-0.43	20	20.1	-	-
TH530	0.16	0.192	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	23.99	23.99	-0.83	20	20	-	-
TH531	2.715	3.258	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	23.99	23.89	-0.83	20	20	-	-
TH532	1.851	2.221	0.15	1.00	0.15	1.8	15.5	Ø20	0.79	0.062	23.89	21.96	-0.53	20	20	-	-
TH533	4.901	5.881	0.25	1.00	0.25	0.3	20	Ø25	0.8	0.045	23.89	23.33	-0.66	20	20.1	-	-
TH534	0.415	0.497	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	23.99	23.97	-0.66	20	20	-	-
TH535	0.353	0.424	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.103	23.97	23.63	-0.43	20	20	-	-
TH536	1.575	1.89	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.103	23.97	23.48	-0.43	20	20	-	-
TH537	5.364	6.437	11.45	0.21	2.44	0	66	Ø75	0.71	0.008	22.67	22.61	-2.03	20	20	-	-
TH538	5.742	6.89	0.45	0.84	0.38	-2.355	26	Ø32	0.71	0.026	22.61	24.78	-0.83	20	20	-	-
TH539	0.145	0.174	0.45	0.81	0.36	-0.145	26	Ø32	0.68	0.025	23.78	23.93	-0.83	20	20	-	-
TH540	0.265	0.318	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	23.93	23.92	-0.83	20	20	-	-
TH541	0.937	1.125	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.92	23.87	-0.66	20	20	-	-
TH542	0.386	0.463	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.87	23.57	-0.43	20	20	-	-
TH543	2.989	3.586	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.87	21.9	-0.53	20	20.1	-	-
TH544	0.397	0.476	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.92	23.62	-0.43	20	20	-	-
TH545	0.152	0.183	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	23.93	23.91	-0.43	20	20	-	-
TH546	4.076	4.891	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.91	23.26	-0.43	20	20.1	-	-
TH547	3.674	4.408	11	0.22	2.38	0	66	Ø75	0.7	0.008	22.61	22.58	-2.03	20	20	-	-

Tubagens																		
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ert} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH548	6.818	8.182	9.4	0.23	2.17	0	60	Ø75	0.77	0.011	22.58	22.49	-1.66	20	20	-	-
TH549	4.293	5.151	0.7	0.70	0.49	-2.5	26	Ø32	0.92	0.042	22.49	24.77	-0.83	20	20	-	-
TH550	0.154	0.185	0.7	0.70	0.49	0	26	Ø32	0.92	0.042	24.77	24.77	-0.83	20	20	-	-
TH551	0.186	0.223	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	23.77	23.76	-0.83	20	20	-	-
TH552	0.189	0.226	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	23.76	23.74	-0.66	20	20	-	-
TH553	0.792	0.95	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	23.74	23.72	-0.66	20	20.1	-	-
TH554	1.883	2.26	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.72	23.33	-0.43	20.1	20.1	-	-
TH555	0.292	0.351	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.72	23.43	-0.43	20.1	20.1	-	-
TH556	0.292	0.351	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.74	23.46	-0.43	20	20	-	-
TH557	3.139	3.766	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	23.76	23.65	-0.83	20	20.1	-	-
TH558	1.856	2.227	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.65	21.76	-0.53	20.1	20.1	-	-
TH559	2.9	3.48	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	23.65	23.24	-0.66	20.1	20.1	-	-
TH560	3.188	3.826	8.7	0.24	2.08	0	60	Ø75	0.73	0.01	22.49	22.45	-1.66	20	20	-	-
TH561	3.988	4.786	6.9	0.26	1.81	0	51	Ø63	0.89	0.017	22.45	22.37	-1.47	20	20	-	-
TH562	4.283	5.139	0.45	0.84	0.38	-2.5	26	Ø32	0.71	0.026	22.37	24.73	-0.83	20	20.1	-	-
TH563	0.155	0.186	0.45	0.84	0.38	0	26	Ø32	0.71	0.026	24.73	24.73	-0.83	20.1	20.1	-	-
TH564	0.19	0.228	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	23.73	23.72	-0.83	20.1	20.1	-	-
TH565	0.474	0.568	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.72	23.7	-0.66	20.1	20.1	-	-
TH566	5.139	6.166	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.7	21.57	-0.53	20.1	20.1	-	-
TH567	0.199	0.239	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.7	23.52	-0.43	20.1	20.1	-	-
TH568	0.858	1.029	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	23.72	23.69	-0.66	20.1	20.1	-	-
TH569	1.389	1.666	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.69	23.27	-0.43	20.1	20.1	-	-
TH570	0.399	0.479	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.69	23.39	-0.43	20.1	20.1	-	-
TH571	7.631	9.157	6.45	0.27	1.74	0	51	Ø63	0.85	0.016	22.37	22.22	-1.46	20	20.1	-	-
TH572	5.56	6.672	0.45	0.84	0.38	-2.37	26	Ø32	0.71	0.026	22.22	24.42	-0.83	20.1	20.1	-	-
TH573	0.13	0.156	0.45	0.81	0.36	-0.13	26	Ø32	0.68	0.025	23.42	23.54	-0.82	20.1	20.1	-	-
TH574	1.119	1.343	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.54	23.26	-0.43	20.1	20.1	-	-
TH575	0.289	0.347	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	23.54	23.54	-0.82	20.1	20.1	-	-
TH576	0.423	0.507	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.54	23.23	-0.43	20.1	20.1	-	-
TH577	0.97	1.165	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.54	23.48	-0.65	20.1	20.1	-	-
TH578	0.416	0.499	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.48	23.18	-0.43	20.1	20.1	-	-
TH579	3.022	3.626	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.48	21.51	-0.53	20.1	20.1	-	-
TH580	2.539	3.047	6	0.28	1.67	0	51	Ø63	0.82	0.015	22.22	22.18	-1.46	20.1	20.1	-	-
TH581	4.283	5.139	0.45	0.84	0.38	-2.5	26	Ø32	0.71	0.026	22.18	24.54	-0.83	20.1	20.1	-	-
TH582	0.155	0.186	0.45	0.84	0.38	0	26	Ø32	0.71	0.026	24.54	24.54	-0.82	20.1	20.1	-	-
TH583	0.19	0.228	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	23.54	23.53	-0.82	20.1	20.1	-	-
TH584	0.474	0.568	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.53	23.51	-0.66	20.1	20.1	-	-
TH585	5.139	6.166	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.51	21.38	-0.53	20.1	20.1	-	-
TH586	0.199	0.239	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.51	23.33	-0.43	20.1	20.1	-	-
TH587	0.858	1.029	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	23.53	23.5	-0.66	20.1	20.1	-	-
TH588	1.389	1.666	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.5	23.08	-0.43	20.1	20.1	-	-
TH589	0.399	0.479	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.5	23.2	-0.43	20.1	20.1	-	-
TH590	7.497	8.996	5.55	0.29	1.6	0	51	Ø63	0.78	0.014	22.18	22.06	-1.46	20.1	20.1	-	-
TH591	2.035	2.442	0.9	0.63	0.57	0	32	Ø40	0.7	0.02	22.06	22.01	-0.99	20.1	20.1	-	-
TH592	3.525	4.23	0.45	0.84	0.38	-2.37	26	Ø32	0.71	0.026	22.01	24.27	-0.82	20.1	20.1	-	-
TH593	0.13	0.156	0.45	0.81	0.36	-0.13	26	Ø32	0.68	0.025	23.27	23.39	-0.82	20.1	20.1	-	-
TH594	1.119	1.343	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.39	23.1	-0.43	20.1	20.1	-	-
TH595	0.289	0.347	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	23.39	23.39	-0.82	20.1	20.1	-	-
TH596	0.423	0.507	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.39	23.08	-0.43	20.1	20.1	-	-
TH597	0.97	1.165	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.39	23.33	-0.65	20.1	20.1	-	-
TH598	0.416	0.499	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.33	23.03	-0.42	20.1	20.1	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH599	3.022	3.626	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.33	21.36	-0.53	20.1	20.1	-	-
TH600	3.623	4.348	0.45	0.84	0.38	-2.403	26	Ø32	0.71	0.026	22.01	24.3	-0.82	20.1	20.1	-	-
TH601	0.097	0.116	0.45	0.81	0.36	-0.097	26	Ø32	0.68	0.025	23.3	23.39	-0.82	20.1	20.1	-	-
TH602	1.356	1.628	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.39	23.07	-0.43	20.1	20.1	-	-
TH603	0.056	0.067	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	23.39	23.39	-0.82	20.1	20.1	-	-
TH604	0.449	0.539	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.39	23.08	-0.43	20.1	20.1	-	-
TH605	0.957	1.148	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.39	23.34	-0.65	20.1	20.1	-	-
TH606	0.442	0.53	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.34	23.03	-0.42	20.1	20.1	-	-
TH607	3.008	3.609	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.34	21.36	-0.53	20.1	20.1	-	-
TH608	5.978	7.174	4.65	0.31	1.44	0	51	Ø63	0.7	0.011	22.06	21.98	-1.46	20.1	20.1	-	-
TH609	4.239	5.087	4.1	0.33	1.34	0	51	Ø63	0.65	0.01	21.98	21.93	-1.45	20.1	20.1	-	-
TH610	0.089	0.107	3.65	0.34	1.25	0	41	Ø50	0.95	0.025	21.93	21.92	-1.21	20.1	20.1	-	-
TH611	5.592	6.71	3.65	0.34	1.25	0	41	Ø50	0.95	0.025	21.92	21.76	-1.21	20.1	20.1	-	-
TH612	4.296	5.155	0.55	0.77	0.42	-2.5	26	Ø32	0.8	0.033	21.76	24.09	-0.82	20.1	20.1	-	-
TH613	0.345	0.414	0.55	0.77	0.42	0	26	Ø32	0.8	0.033	24.09	24.07	-0.82	20.1	20.1	-	-
TH614	0.442	0.53	0.55	0.73	0.4	0	26	Ø32	0.76	0.03	23.07	23.06	-0.82	20.1	20.1	-	-
TH615	0.291	0.349	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	23.06	22.77	-0.42	20.1	20.1	-	-
TH616	1.016	1.219	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	23.06	23.03	-0.82	20.1	20.1	-	-
TH617	0.292	0.35	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	23.03	22.74	-0.42	20.1	20.1	-	-
TH618	1.089	1.307	0.35	1.00	0.35	0	26	Ø32	0.66	0.023	23.03	23	-0.82	20.1	20.1	-	-
TH619	0.205	0.246	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.102	23	22.82	-0.42	20.1	20.1	-	-
TH620	3.479	4.175	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	23	22.56	-0.65	20.1	20.1	-	-
TH621	6.721	8.065	3.1	0.38	1.16	0	41	Ø50	0.88	0.022	21.76	21.58	-1.21	20.1	20.1	-	-
TH622	1.8	2.16	0.55	0.77	0.42	0	26	Ø32	0.8	0.033	21.58	21.51	-0.82	20.1	20.1	-	-
TH623	2.346	2.816	0.55	0.77	0.42	-2.346	26	Ø32	0.8	0.033	21.51	23.76	-0.82	20.1	20.1	-	-
TH624	0.104	0.124	0.55	0.73	0.4	-0.104	26	Ø32	0.76	0.03	22.76	22.86	-0.82	20.1	20.1	-	-
TH625	0.374	0.448	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	22.86	22.85	-0.65	20.1	20.1	-	-
TH626	1.005	1.206	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	22.85	22.73	-0.42	20.1	20.1	-	-
TH627	0.043	0.052	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	22.73	22.72	-0.42	20.1	20.1	-	-
TH628	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	22.72	22.5	-0.42	20.1	20.1	-	-
TH629	0.05	0.06	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	22.85	22.84	-0.42	20.1	20.1	-	-
TH630	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	22.84	22.62	-0.42	20.1	20.1	-	-
TH631	0.691	0.829	0.35	1.00	0.35	0	26	Ø32	0.66	0.023	22.86	22.84	-0.82	20.1	20.1	-	-
TH632	0.017	0.02	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	22.84	22.84	-0.42	20.1	20.1	-	-
TH633	0.1	0.121	0.1	1.00	0.1	0.1	12	Ø16	0.88	0.102	22.84	22.73	-0.42	20.1	20.1	-	-
TH634	3.562	4.274	0.25	1.00	0.25	0.2	20	Ø25	0.8	0.045	22.84	22.45	-0.65	20.1	20.1	-	-
TH635	1.376	1.651	2.55	0.41	1.04	0	41	Ø50	0.79	0.018	21.58	21.55	-1.21	20.1	20.1	-	-
TH636	6.424	7.709	2.55	0.41	1.04	0	41	Ø50	0.79	0.018	21.55	21.41	-1.21	20.1	20.1	-	-
TH637	5.56	6.672	0.45	0.84	0.38	-2.37	26	Ø32	0.71	0.026	21.41	23.6	-0.81	20.1	20.1	-	-
TH638	0.13	0.156	0.45	0.81	0.36	-0.13	26	Ø32	0.68	0.025	22.6	22.73	-0.81	20.1	20.1	-	-
TH639	1.119	1.343	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.102	22.73	22.44	-0.42	20.1	20.1	-	-
TH640	0.289	0.347	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	22.73	22.72	-0.81	20.1	20.1	-	-
TH641	0.423	0.507	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	22.72	22.42	-0.42	20.1	20.1	-	-
TH642	0.97	1.165	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	22.72	22.67	-0.65	20.1	20.1	-	-
TH643	0.416	0.499	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	22.67	22.37	-0.42	20.1	20.1	-	-
TH644	3.022	3.626	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	22.67	20.7	-0.52	20.1	20.1	-	-
TH645	1.554	1.864	2.1	0.44	0.93	0	41	Ø50	0.7	0.015	21.41	21.38	-1.21	20.1	20.1	-	-
TH646	13.703	16.444	0.7	0.70	0.49	-2.5	26	Ø32	0.92	0.042	21.38	23.2	-0.81	20.1	20.1	-	-
TH647	0.077	0.092	0.7	0.70	0.49	0	26	Ø32	0.92	0.042	23.2	23.19	-0.81	20.1	20.1	-	-
TH648	0.071	0.085	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	22.19	22.19	-0.81	20.1	20.1	-	-
TH649	0.313	0.376	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	22.19	22.18	-0.81	20.1	20.1	-	-

Tubagens																	
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ert} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH650	0.764	0.916	0.5	0.80	0.4	0	26	Ø32	0.75	0.029	22.18	22.15	-0.81	20.1	20.1	-	-
TH651	0.601	0.721	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	22.15	22.13	-0.81	20.1	20.1	-	-
TH652	5.31	6.373	0.25	1.00	0.25	-0.25	20	Ø25	0.8	0.045	22.13	22.1	-0.64	20.1	20.1	-	-
TH653	2.41	2.891	0.25	1.00	0.25	0.5	20	Ø25	0.8	0.045	22.1	21.47	-0.64	20.1	20.1	-	-
TH654	2.452	2.943	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	22.13	20.2	-0.52	20.1	20.1	-	-
TH655	0.409	0.49	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	22.15	21.85	-0.42	20.1	20.1	-	-
TH656	2.55	3.06	0.1	1.00	0.1	2.55	12	Ø16	0.88	0.102	22.18	19.32	-0.42	20.1	20.1	-	-
TH657	5.792	6.95	0.1	1.00	0.1	-2.55	12	Ø16	0.88	0.102	19.32	21.15	-0.42	20.1	20.1	-	-
TH658	0.37	0.444	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.102	21.15	20.96	-0.41	20.1	20.1	-	-
TH659	0.376	0.451	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	22.19	21.9	-0.42	20.1	20.1	-	-
TH660	1.02	1.224	1.4	0.52	0.73	0	32	Ø40	0.91	0.032	21.38	21.35	-0.98	20.1	20.1	-	-
TH661	3.397	4.077	0.7	0.70	0.49	-2.5	26	Ø32	0.92	0.042	21.35	23.68	-0.81	20.1	20.1	-	-
TH662	0.191	0.23	0.7	0.70	0.49	0	26	Ø32	0.92	0.042	23.68	23.67	-0.81	20.1	20.1	-	-
TH663	0.149	0.179	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	22.67	22.66	-0.81	20.1	20.1	-	-
TH664	0.045	0.054	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	22.66	22.66	-0.65	20.1	20.1	-	-
TH665	0.731	0.878	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	22.66	22.63	-0.65	20.1	20.1	-	-
TH666	1.69	2.028	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.102	22.63	22.27	-0.42	20.1	20.1	-	-
TH667	0.417	0.5	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	22.63	22.33	-0.42	20.1	20.1	-	-
TH668	0.411	0.493	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	22.66	22.36	-0.42	20.1	20.1	-	-
TH669	3.408	4.09	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	22.66	22.54	-0.81	20.1	20.1	-	-
TH670	1.777	2.133	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	22.54	20.66	-0.52	20.1	20.1	-	-
TH671	4.362	5.235	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	22.54	22.06	-0.64	20.1	20.1	-	-
TH672	8.076	9.691	0.7	0.70	0.49	-2.5	26	Ø32	0.92	0.042	21.35	23.44	-0.81	20.1	20.1	-	-
TH673	0.133	0.16	0.7	0.70	0.49	0	26	Ø32	0.92	0.042	23.44	23.43	-0.81	20.1	20.1	-	-
TH674	0.107	0.128	0.7	0.65	0.46	0	26	Ø32	0.86	0.037	22.43	22.43	-0.81	20.1	20.1	-	-
TH675	0.329	0.395	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	22.43	22.41	-0.64	20.1	20.1	-	-
TH676	0.771	0.925	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	22.41	22.38	-0.64	20.1	20.1	-	-
TH677	1.586	1.903	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.102	22.38	22.03	-0.42	20.1	20.1	-	-
TH678	0.364	0.437	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	22.38	22.08	-0.42	20.1	20.1	-	-
TH679	0.378	0.454	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.102	22.41	22.11	-0.42	20.1	20.1	-	-
TH680	3.167	3.801	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	22.43	22.32	-0.81	20.1	20.1	-	-
TH681	1.89	2.268	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	22.32	20.43	-0.52	20.1	20.1	-	-
TH682	5.186	6.224	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	22.32	21.79	-0.64	20.1	20.1	-	-
TH683	5.263	6.315	0.45	0.84	0.38	-2.331	26	Ø32	0.71	0.026	21.93	24.09	-0.82	20.1	20.1	-	-
TH684	0.219	0.262	0.45	0.81	0.36	-0.219	26	Ø32	0.68	0.025	23.09	23.3	-0.82	20.1	20.1	-	-
TH685	0.32	0.384	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	23.3	23.29	-0.82	20.1	20.1	-	-
TH686	0.962	1.154	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.29	23.24	-0.65	20.1	20.1	-	-
TH687	3.013	3.616	0.15	1.00	0.15	1.8	15.5	Ø20	0.79	0.062	23.24	21.22	-0.52	20.1	20.1	-	-
TH688	0.442	0.531	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.102	23.24	22.89	-0.42	20.1	20.1	-	-
TH689	0.442	0.531	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.102	23.29	22.94	-0.42	20.1	20.1	-	-
TH690	0.759	0.911	0.1	1.00	0.1	0	12	Ø16	0.88	0.102	23.3	23.21	-0.42	20.1	20.1	-	-
TH691	0.322	0.386	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	23.21	22.97	-0.42	20.1	20.1	-	-
TH692	4.181	5.017	0.55	0.77	0.42	-2.5	26	Ø32	0.8	0.033	21.98	24.31	-0.82	20.1	20.1	-	-
TH693	0.325	0.39	0.55	0.77	0.42	0	26	Ø32	0.8	0.033	24.31	24.3	-0.82	20.1	20.1	-	-
TH694	0.283	0.34	0.55	0.73	0.4	0	26	Ø32	0.76	0.03	23.3	23.29	-0.82	20.1	20.1	-	-
TH695	0.412	0.495	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.29	22.99	-0.42	20.1	20.1	-	-
TH696	1.048	1.258	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	23.29	23.26	-0.82	20.1	20.1	-	-
TH697	0.399	0.479	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.26	22.96	-0.42	20.1	20.1	-	-
TH698	1.042	1.251	0.35	1.00	0.35	0	26	Ø32	0.66	0.023	23.26	23.23	-0.82	20.1	20.1	-	-
TH699	0.308	0.37	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.23	23.04	-0.42	20.1	20.1	-	-
TH700	3.623	4.347	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	23.23	22.79	-0.65	20.1	20.1	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH701	3.235	3.882	1.8	0.47	0.85	0	41	Ø50	0.64	0.013	22.45	22.4	-1.23	20	20	-	-
TH702	5.77	6.924	1.35	0.53	0.72	0	32	Ø40	0.89	0.03	22.4	22.19	-1	20	20.1	-	-
TH703	4.022	4.826	0.45	0.84	0.38	-2.5	26	Ø32	0.71	0.026	22.19	24.56	-0.83	20.1	20.1	-	-
TH704	0.184	0.22	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	23.56	23.56	-0.82	20.1	20.1	-	-
TH705	1.101	1.322	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	23.56	23.53	-0.82	20.1	20.1	-	-
TH706	1.014	1.216	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.53	23.48	-0.65	20.1	20.1	-	-
TH707	4.919	5.903	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.48	21.36	-0.53	20.1	20.1	-	-
TH708	0.15	0.18	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.48	23.31	-0.43	20.1	20.1	-	-
TH709	0.25	0.3	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.53	23.25	-0.43	20.1	20.1	-	-
TH710	0.25	0.3	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.56	23.28	-0.43	20.1	20.1	-	-
TH711	8.341	10.01	0.9	0.63	0.57	0	32	Ø40	0.7	0.02	22.19	21.99	-0.99	20.1	20.1	-	-
TH712	3.533	4.24	0.45	0.84	0.38	-2.5	26	Ø32	0.71	0.026	21.99	24.38	-0.82	20.1	20.1	-	-
TH713	0.138	0.166	0.45	0.84	0.38	0	26	Ø32	0.71	0.026	24.38	24.37	-0.82	20.1	20.1	-	-
TH714	0.335	0.402	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	23.37	23.36	-0.82	20.1	20.1	-	-
TH715	1.033	1.24	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	23.36	23.34	-0.82	20.1	20.1	-	-
TH716	1.033	1.24	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.34	23.28	-0.65	20.1	20.1	-	-
TH717	5.055	6.066	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.28	21.16	-0.52	20.1	20.1	-	-
TH718	0.293	0.351	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.102	23.28	23.1	-0.42	20.1	20.1	-	-
TH719	0.393	0.471	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.34	23.04	-0.42	20.1	20.1	-	-
TH720	0.393	0.471	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.36	23.07	-0.42	20.1	20.1	-	-
TH721	12.976	15.572	0.45	0.84	0.38	-2.55	26	Ø32	0.71	0.026	21.99	24.13	-0.82	20.1	20.1	-	-
TH722	0.113	0.135	0.45	0.84	0.38	0	26	Ø32	0.71	0.026	24.13	24.12	-0.81	20.1	20.1	-	-
TH723	0.316	0.379	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	23.12	23.12	-0.81	20.1	20.1	-	-
TH724	0.828	0.993	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	23.12	23.09	-0.65	20.1	20.1	-	-
TH725	1.632	1.959	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.102	23.09	22.68	-0.42	20.1	20.1	-	-
TH726	0.483	0.579	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.102	23.09	22.73	-0.42	20.1	20.1	-	-
TH727	0.138	0.166	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.12	23.11	-0.65	20.1	20.1	-	-
TH728	0.345	0.414	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.102	23.11	22.77	-0.42	20.1	20.1	-	-
TH729	2.848	3.418	0.15	1.00	0.15	1.8	15.5	Ø20	0.79	0.062	23.11	21.1	-0.52	20.1	20.1	-	-
TH730	4.743	5.691	0.45	0.84	0.38	-2.369	26	Ø32	0.71	0.026	22.4	24.62	-0.83	20	20.1	-	-
TH731	0.131	0.157	0.45	0.81	0.36	-0.131	26	Ø32	0.68	0.025	23.62	23.75	-0.83	20.1	20.1	-	-
TH732	0.092	0.11	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	23.75	23.74	-0.83	20.1	20.1	-	-
TH733	0.407	0.488	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	23.74	23.73	-0.83	20.1	20.1	-	-
TH734	0.28	0.336	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.73	23.45	-0.43	20.1	20.1	-	-
TH735	0.956	1.148	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	23.73	23.68	-0.66	20.1	20.1	-	-
TH736	0.281	0.337	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	23.68	23.4	-0.43	20.1	20.1	-	-
TH737	2.899	3.479	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	23.68	21.72	-0.53	20.1	20.1	-	-
TH738	0.878	1.053	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	23.74	23.49	-0.43	20.1	20.1	-	-
TH739	0.813	0.976	6.15	0.28	1.7	0	55.4	Ø63	0.7	0.01	22.58	22.57	-1.72	20	20	-	-
TH740	4.488	5.385	6.15	0.28	1.7	-2.75	55.4	Ø63	0.7	0.01	22.57	25.26	-1.72	20	20	-	-
TH741	4.742	5.69	1.6	0.49	0.79	-2.5	32	Ø40	0.98	0.036	22.57	24.86	-1	20	20	-	-
TH742	0.255	0.306	1.6	0.49	0.79	0	32	Ø40	0.98	0.036	24.86	24.85	-1	20	20	-	-
TH743	0.345	0.414	1.6	0.44	0.7	0	32	Ø40	0.87	0.029	23.85	23.84	-1	20	20	-	-
TH744	0.547	0.656	1.4	0.46	0.65	0	32	Ø40	0.81	0.026	23.84	23.82	-1	20	20	-	-
TH745	0.617	0.741	1.2	0.50	0.6	0	32	Ø40	0.75	0.022	23.82	23.8	-1	20	20	-	-
TH746	0.633	0.76	1	0.55	0.55	0	32	Ø40	0.68	0.019	23.8	23.79	-1	20	20	-	-
TH747	0.563	0.675	0.8	0.61	0.49	0	26	Ø32	0.92	0.042	23.79	23.76	-0.83	20	20	-	-
TH748	0.539	0.647	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	23.76	23.74	-0.83	20	20	-	-
TH749	0.57	0.685	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	23.74	23.72	-0.83	20	20	-	-
TH750	1.292	1.551	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	23.72	23.12	-0.66	20	20.1	-	-
TH751	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	23.72	23.15	-0.66	20	20.1	-	-

Tubagens																		
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ert} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH752	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	23.74	23.17	-0.66	20	20	-	-
TH753	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	23.76	23.19	-0.66	20	20	-	-
TH754	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	23.79	23.22	-0.66	20	20	-	-
TH755	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	23.8	23.23	-0.66	20	20	-	-
TH756	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	23.82	23.25	-0.66	20	20	-	-
TH757	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	23.84	23.27	-0.66	20	20	-	-
TH758	0.799	0.959	7.1	0.21	1.5	0	51	Ø63	0.73	0.012	23.12	23.11	-1.49	20	20	-	-
TH759	4.502	5.402	7.1	0.21	1.5	-2.75	51	Ø63	0.73	0.012	23.11	25.79	-1.49	20	20	-	-
TH760	4.134	4.96	1.6	0.49	0.79	-2.5	32	Ø40	0.98	0.036	23.11	25.43	-1.01	20	20	-	-
TH761	0.255	0.306	1.6	0.49	0.79	0	32	Ø40	0.98	0.036	25.43	25.42	-1.01	20	20	-	-
TH762	0.345	0.414	1.6	0.44	0.7	0	32	Ø40	0.87	0.029	24.42	24.41	-1.01	20	20	-	-
TH763	0.547	0.656	1.4	0.46	0.65	0	32	Ø40	0.81	0.026	24.41	24.39	-1.01	20	20	-	-
TH764	0.617	0.741	1.2	0.50	0.6	0	32	Ø40	0.75	0.022	24.39	24.37	-1.01	20	20	-	-
TH765	0.633	0.76	1	0.55	0.55	0	32	Ø40	0.68	0.019	24.37	24.36	-1.01	20	20	-	-
TH766	0.563	0.675	0.8	0.61	0.49	0	26	Ø32	0.92	0.042	24.36	24.33	-0.84	20	20	-	-
TH767	0.539	0.647	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	24.33	24.31	-0.84	20	20	-	-
TH768	0.57	0.685	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	24.31	24.29	-0.84	20	20	-	-
TH769	1.292	1.551	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.29	23.69	-0.67	20	20	-	-
TH770	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.29	23.72	-0.67	20	20	-	-
TH771	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.31	23.74	-0.67	20	20	-	-
TH772	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.33	23.76	-0.67	20	20	-	-
TH773	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.36	23.79	-0.67	20	20	-	-
TH774	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.37	23.8	-0.67	20	20	-	-
TH775	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.39	23.82	-0.67	20	20	-	-
TH776	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.41	23.83	-0.67	20	20	-	-
TH777	4.049	4.858	0.7	0.70	0.49	-2.328	26	Ø32	0.92	0.042	23.17	25.3	-0.84	20	20	-	-
TH778	0.172	0.207	0.7	0.65	0.46	-0.172	26	Ø32	0.86	0.037	24.3	24.46	-0.84	20	20	-	-
TH779	2.418	2.901	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	24.46	24.38	-0.84	20	20	-	-
TH780	1.832	2.199	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.38	22.49	-0.54	20	20	-	-
TH781	4.993	5.992	0.25	1.00	0.25	0.25	20	Ø25	0.8	0.045	24.38	23.86	-0.67	20	20	-	-
TH782	0.816	0.979	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	24.46	24.4	-0.67	20	20	-	-
TH783	0.401	0.482	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.4	24.1	-0.44	20	20	-	-
TH784	0.754	0.904	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	24.4	24.38	-0.67	20	20	-	-
TH785	0.401	0.482	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.38	24.08	-0.43	20	20	-	-
TH786	1.982	2.378	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.38	23.98	-0.43	20	20	-	-
TH787	4.492	5.39	0.9	0.58	0.52	-2.5	26	Ø32	0.98	0.046	23.31	25.56	-0.85	20	20	-	-
TH788	0.15	0.181	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	25.56	25.55	-0.84	20	20	-	-
TH789	0.17	0.204	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	24.55	24.55	-0.84	20	20	-	-
TH790	0.352	0.422	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	24.55	24.54	-0.84	20	20	-	-
TH791	0.905	1.086	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.54	24.49	-0.67	20	20	-	-
TH792	3.003	3.603	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.49	22.52	-0.54	20	20	-	-
TH793	0.36	0.432	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.49	24.2	-0.44	20	20	-	-
TH794	0.387	0.465	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.54	24.24	-0.44	20	20	-	-
TH795	1.125	1.35	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.55	24.26	-0.44	20	20	-	-
TH796	2.5	3	0.45	0.84	0.38	2.5	26	Ø32	0.71	0.026	25.56	22.98	-0.84	20	20	-	-
TH797	2.474	2.969	0.45	0.84	0.38	-2.373	26	Ø32	0.71	0.026	22.98	25.27	-0.84	20	20	-	-
TH798	0.127	0.153	0.45	0.81	0.36	-0.127	26	Ø32	0.68	0.025	24.27	24.4	-0.84	20	20	-	-
TH799	0.486	0.583	0.35	0.91	0.32	0	26	Ø32	0.6	0.02	24.4	24.39	-0.84	20	20	-	-
TH800	0.283	0.34	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.39	24.1	-0.44	20	20	-	-
TH801	0.891	1.07	0.25	1.00	0.25	0	20	Ø25	0.8	0.045	24.39	24.34	-0.67	20	20	-	-
TH802	0.311	0.373	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	24.34	24.05	-0.43	20	20	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH803	2.919	3.503	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	24.34	22.37	-0.54	20	20	-	-
TH804	0.896	1.075	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.103	24.4	24.14	-0.44	20	20	-	-
TH805	1.717	2.06	6.5	0.27	1.75	0	51	Ø63	0.86	0.016	23.6	23.57	-1.5	20	20	-	-
TH806	3.44	4.128	1.6	0.49	0.79	-2.5	32	Ø40	0.98	0.036	23.57	25.92	-1.02	20	20	-	-
TH807	0.255	0.306	1.6	0.49	0.79	0	32	Ø40	0.98	0.036	25.92	25.91	-1.02	20	20	-	-
TH808	0.345	0.414	1.6	0.44	0.7	0	32	Ø40	0.87	0.029	24.91	24.89	-1.02	20	20	-	-
TH809	0.547	0.656	1.4	0.46	0.65	0	32	Ø40	0.81	0.026	24.89	24.88	-1.02	20	20	-	-
TH810	0.617	0.741	1.2	0.50	0.6	0	32	Ø40	0.75	0.022	24.88	24.86	-1.02	20	20	-	-
TH811	0.633	0.76	1	0.55	0.55	0	32	Ø40	0.68	0.019	24.86	24.85	-1.02	20	20	-	-
TH812	0.563	0.675	0.8	0.61	0.49	0	26	Ø32	0.92	0.042	24.85	24.82	-0.85	20	20	-	-
TH813	0.539	0.647	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	24.82	24.8	-0.85	20	20	-	-
TH814	0.57	0.685	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	24.8	24.78	-0.85	20	20	-	-
TH815	1.292	1.551	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.78	24.18	-0.67	20	20	-	-
TH816	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.78	24.2	-0.67	20	20	-	-
TH817	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.8	24.22	-0.67	20	20	-	-
TH818	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.82	24.25	-0.68	20	20	-	-
TH819	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.85	24.27	-0.68	20	20	-	-
TH820	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.86	24.29	-0.68	20	20	-	-
TH821	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.88	24.3	-0.68	20	20	-	-
TH822	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	24.89	24.32	-0.68	20	20	-	-
TH823	5.074	6.088	6.5	0.27	1.75	-1.25	51	Ø63	0.86	0.016	23.57	24.72	-1.5	20	20	-	-
TH824	0.744	0.893	6.5	0.27	1.75	0	51	Ø63	0.86	0.016	24.72	24.7	-1.5	20	20	-	-
TH825	1.5	1.8	6.5	0.27	1.75	-1.5	51	Ø63	0.86	0.016	24.7	26.18	-1.5	20	20	-	-
TH826	10.806	12.967	7.7	0.25	1.93	0	51	Ø63	0.95	0.019	24.59	24.34	-1.53	20	20	-	-
TH827	6.112	7.335	6	0.28	1.67	0	51	Ø63	0.82	0.015	24.34	24.23	-1.53	20	20	-	-
TH828	0.4	0.48	1.4	0.57	0.8	0	32	Ø40	0.99	0.037	24.23	24.21	-1.04	20	20	-	-
TH829	0.951	1.141	1.4	0.57	0.8	0	32	Ø40	0.99	0.037	24.21	24.17	-1.04	20	20	-	-
TH830	2.724	3.268	0.8	1.00	0.8	-2.45	32	Ø40	0.99	0.037	24.17	26.5	-1.04	20	20	-	-
TH831	4.684	5.621	0.8	0.61	0.49	0	26	Ø32	0.92	0.042	25.5	25.27	-0.86	20	20	-	-
TH832	0.545	0.654	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	25.27	25.24	-0.86	20	20	-	-
TH833	0.61	0.731	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	25.24	25.22	-0.86	20	20	-	-
TH834	1.258	1.509	0.2	1.00	0.2	0.5	20	Ø25	0.64	0.03	25.22	24.68	-0.68	20	20	-	-
TH835	0.602	0.722	0.2	1.00	0.2	0.5	20	Ø25	0.64	0.03	25.22	24.7	-0.68	20	20	-	-
TH836	0.602	0.722	0.2	1.00	0.2	0.5	20	Ø25	0.64	0.03	25.24	24.72	-0.68	20	20	-	-
TH837	0.602	0.722	0.2	1.00	0.2	0.5	20	Ø25	0.64	0.03	25.27	24.74	-0.68	20	20	-	-
TH838	6.618	7.942	0.6	1.00	0.6	-2.5	32	Ø40	0.75	0.022	24.17	26.49	-1.04	20	20	-	-
TH839	0.678	0.814	0.6	1.00	0.6	0	32	Ø40	0.75	0.022	26.49	26.48	-1.03	20	20	-	-
TH840	0.435	0.522	0.6	1.00	0.6	0	32	Ø40	0.75	0.022	25.48	25.46	-1.03	20	20	-	-
TH841	1.396	1.676	0.3	1.00	0.3	0.75	20	Ø25	0.95	0.062	25.46	24.61	-0.68	20	20	-	-
TH842	0.833	1	0.3	1.00	0.3	0.75	20	Ø25	0.95	0.062	25.46	24.65	-0.68	20	20	-	-
TH843	2.853	3.423	6	0.28	1.67	0	51	Ø63	0.82	0.015	24.23	24.18	-1.53	20	20	-	-
TH844	2.107	2.528	6	0.28	1.67	0	51	Ø63	0.82	0.015	24.18	24.14	-1.52	20	20	-	-
TH845	0.038	0.046	6	0.28	1.67	0	51	Ø63	0.82	0.015	24.14	24.14	-1.52	20	20	-	-
TH846	3.021	3.625	1.6	0.49	0.79	-2.5	32	Ø40	0.98	0.036	24.14	26.51	-1.04	20	20	-	-
TH847	0.255	0.306	1.6	0.49	0.79	0	32	Ø40	0.98	0.036	26.51	26.5	-1.04	20	20	-	-
TH848	0.345	0.414	1.6	0.44	0.7	0	32	Ø40	0.87	0.029	25.5	25.49	-1.04	20	20	-	-
TH849	0.547	0.656	1.4	0.46	0.65	0	32	Ø40	0.81	0.026	25.49	25.47	-1.04	20	20	-	-
TH850	0.617	0.741	1.2	0.50	0.6	0	32	Ø40	0.75	0.022	25.47	25.45	-1.04	20	20	-	-
TH851	0.633	0.76	1	0.55	0.55	0	32	Ø40	0.68	0.019	25.45	25.44	-1.04	20	20	-	-
TH852	0.563	0.675	0.8	0.61	0.49	0	26	Ø32	0.92	0.042	25.44	25.41	-0.86	20	20	-	-
TH853	0.539	0.647	0.6	0.70	0.42	0	26	Ø32	0.79	0.032	25.41	25.39	-0.86	20	20	-	-

Tubagens																	
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ert} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH854	0.57	0.685	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	25.39	25.37	-0.86	20	20	-	-
TH855	1.292	1.551	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	25.37	24.77	-0.68	20	20	-	-
TH856	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	25.37	24.8	-0.68	20	20	-	-
TH857	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	25.39	24.82	-0.68	20	20	-	-
TH858	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	25.41	24.84	-0.68	20	20	-	-
TH859	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	25.44	24.87	-0.68	20	20	-	-
TH860	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	25.45	24.88	-0.68	20	20	-	-
TH861	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	25.47	24.9	-0.68	20	20	-	-
TH862	0.613	0.736	0.2	1.00	0.2	0.55	20	Ø25	0.64	0.03	25.49	24.91	-0.69	20	20	-	-
TH863	1.531	1.838	6	0.28	1.67	-1.25	51	Ø63	0.82	0.015	24.14	25.36	-1.52	20	20	-	-
TH864	1.5	1.8	6	0.23	1.37	-1.5	51	Ø63	0.67	0.01	25.36	26.85	-1.52	20	20	-	-
TH865	8.196	9.835	0.7	0.70	0.49	-2.165	26	Ø32	0.92	0.042	24.18	25.93	-0.86	20	20	-	-
TH866	0.285	0.342	0.7	0.65	0.46	-0.285	26	Ø32	0.86	0.037	24.93	25.21	-0.86	20	20	-	-
TH867	0.034	0.041	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	25.21	25.2	-0.68	20	20	-	-
TH868	1.041	1.249	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	25.2	25.17	-0.68	20	20	-	-
TH869	4.931	5.918	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	25.17	24.56	-0.44	20	20	-	-
TH870	0.1	0.12	0.1	1.00	0.1	0.1	12	Ø16	0.88	0.103	24.56	24.45	-0.44	20	20	-	-
TH871	0.512	0.615	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	25.17	24.9	-0.44	20	20	-	-
TH872	0.512	0.615	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	25.2	24.94	-0.44	20	20	-	-
TH873	3.347	4.016	0.4	1.00	0.4	0	26	Ø32	0.75	0.029	25.21	25.09	-0.86	20	20	-	-
TH874	1.856	2.227	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.062	25.09	23.25	-0.55	20	20	-	-
TH875	2.853	3.424	0.25	1.00	0.25	0.2	20	Ø25	0.8	0.045	25.09	24.74	-0.68	20	20	-	-
TH876	2.111	2.534	2.3	0.36	0.84	0	44	Ø50	0.55	0.009	24.34	24.32	-1.44	20	20	-	-
TH877	11.605	13.926	1.7	0.48	0.82	0	41	Ø50	0.62	0.012	24.32	24.15	-1.28	20	20	-	-
TH878	3.058	3.669	1.7	0.48	0.82	0	41	Ø50	0.62	0.012	24.15	24.11	-1.27	20	20	-	-
TH879	12.991	15.589	1.7	0.48	0.82	-2.75	41	Ø50	0.62	0.012	24.11	26.67	-1.27	20	20	-	-
TH880	5.585	6.702	0.3	0.98	0.29	-2.5	20	Ø25	0.94	0.06	24.11	26.21	-0.68	20	20	-	-
TH881	0.16	0.192	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	26.21	26.2	-0.68	20	20	-	-
TH882	0.479	0.575	0.3	0.98	0.29	0	20	Ø25	0.94	0.06	25.2	25.16	-0.68	20	20	-	-
TH883	0.939	1.127	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	25.16	25.13	-0.68	20	20	-	-
TH884	0.304	0.364	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	25.13	24.84	-0.44	20	20	-	-
TH885	1.235	1.481	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	25.13	24.73	-0.44	20	20	-	-
TH886	0.303	0.364	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	25.16	24.87	-0.44	20	20	-	-
TH887	11.284	13.54	0.75	0.63	0.47	-2.55	26	Ø32	0.89	0.039	24.15	26.17	-0.86	20	20	-	-
TH888	0.105	0.126	0.75	0.63	0.47	0	26	Ø32	0.89	0.039	26.17	26.17	-0.85	20	20	-	-
TH889	0.274	0.329	0.75	0.63	0.47	0	26	Ø32	0.89	0.039	25.17	25.15	-0.85	20	20	-	-
TH890	0.897	1.076	0.65	0.67	0.44	0	26	Ø32	0.83	0.034	25.15	25.12	-0.85	20	20	-	-
TH891	0.053	0.063	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	25.12	25.11	-0.68	20	20	-	-
TH892	1.433	1.72	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.103	25.11	24.64	-0.44	20	20	-	-
TH893	0.48	0.576	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.103	25.11	24.75	-0.44	20	20	-	-
TH894	0.643	0.771	0.45	0.81	0.36	0	26	Ø32	0.68	0.025	25.12	25.1	-0.85	20	20	-	-
TH895	1.893	2.272	0.15	1.00	0.15	1.8	15.5	Ø20	0.79	0.062	25.1	23.16	-0.55	20	20	-	-
TH896	0.745	0.894	0.3	1.00	0.3	0	20	Ø25	0.95	0.062	25.1	25.04	-0.68	20	20	-	-
TH897	1.895	2.274	0.15	1.00	0.15	1.8	15.5	Ø20	0.79	0.062	25.04	23.1	-0.55	20	20	-	-
TH898	3.03	3.636	0.15	1.00	0.15	1.8	15.5	Ø20	0.79	0.062	25.04	23.02	-0.55	20	20	-	-
TH899	0.456	0.547	0.1	1.00	0.1	0.3	12	Ø16	0.88	0.103	25.15	24.8	-0.44	20	20	-	-
TH900	4.547	5.457	1.25	0.55	0.68	0.05	32	Ø40	0.85	0.028	24.32	24.11	-1.04	20	20	-	-
TH901	4.994	5.993	0.65	0.72	0.47	-2.55	26	Ø32	0.88	0.039	24.11	26.43	-0.86	20	20	-	-
TH902	0.033	0.04	0.15	1.00	0.15	0	15.5	Ø20	0.79	0.062	26.43	26.43	-0.55	20	20	-	-
TH903	1.782	2.138	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	25.43	23.55	-0.55	20	20	-	-
TH904	1.767	2.121	0.5	0.80	0.4	0	26	Ø32	0.76	0.03	26.43	26.37	-0.86	20	20	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH905	0.061	0.073	0.5	0.80	0.4	0	26	Ø32	0.76	0.03	26.37	26.37	-0.86	20	20	-	-
TH906	0.162	0.195	0.15	1.00	0.15	0.152	15.5	Ø20	0.79	0.062	26.37	26.2	-0.55	20	20	-	-
TH907	1.598	1.917	0.15	1.00	0.15	1.598	15.5	Ø20	0.79	0.062	25.2	23.49	-0.55	20	20	-	-
TH908	1.444	1.733	0.35	0.93	0.33	0	26	Ø32	0.61	0.02	26.37	26.33	-0.86	20	20	-	-
TH909	0.139	0.167	0.15	1.00	0.15	0	15.5	Ø20	0.79	0.062	26.33	26.32	-0.55	20	20	-	-
TH910	1.875	2.25	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.062	25.32	23.43	-0.55	20	20	-	-
TH911	4.652	5.582	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	26.33	26.16	-0.68	20	20	-	-
TH912	0.045	0.054	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	26.16	26.16	-0.68	20	20	-	-
TH913	0.389	0.467	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	25.16	25.15	-0.68	20	20	-	-
TH914	0.129	0.154	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	25.15	25.13	-0.44	20	20	-	-
TH915	0.25	0.3	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	25.13	24.85	-0.44	20	20	-	-
TH916	1.603	1.923	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.103	25.15	24.7	-0.44	20	20	-	-
TH917	2.318	2.781	0.6	1.00	0.6	-1.8	32	Ø40	0.75	0.022	24.11	25.85	-1.04	20	20	-	-
TH918	0.293	0.351	0.6	1.00	0.6	0	32	Ø40	0.75	0.022	25.85	25.84	-1.04	20	20	-	-
TH919	0.387	0.464	0.6	1.00	0.6	0	32	Ø40	0.75	0.022	24.84	24.83	-1.04	20	20	-	-
TH920	0.08	0.096	0.3	1.00	0.3	0	20	Ø25	0.95	0.062	24.83	24.83	-0.69	20	20	-	-
TH921	2.94	3.528	0.3	1.00	0.3	0	20	Ø25	0.95	0.062	24.83	24.61	-0.69	20	20	-	-
TH922	0.33	0.396	4.3	0.32	1.37	0	44	Ø50	0.9	0.021	27.88	27.88	-1.45	20	20	-	-
Restaurante/cozinha	1.324	1.588	3.1	0.38	1.16	0	41	Ø50	0.88	0.022	27.88	27.84	-1.28	20	20	-	-
TH924	13.657	16.389	3.1	0.38	1.16	3.25	41	Ø50	0.88	0.022	27.84	24.23	-1.28	20	20	-	-
TH925	6.458	7.75	2.8	0.39	1.1	0	41	Ø50	0.83	0.02	24.23	24.08	-1.28	20	20	-	-
TH926	1.573	1.887	1.3	0.54	0.7	0	32	Ø40	0.87	0.029	24.08	24.02	-1.04	20	20	-	-
TH927	2.703	3.244	1.3	0.54	0.7	0	32	Ø40	0.87	0.029	24.02	23.93	-1.04	20	20	-	-
TH928	4.216	5.06	0.65	0.85	0.55	0	32	Ø40	0.68	0.019	23.93	23.83	-1.03	20	20	-	-
TH929	3.626	4.351	0.1	1.00	0.1	-2.45	12	Ø16	0.88	0.103	23.83	25.84	-0.44	20	20	-	-
TH930	0.964	1.157	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	24.84	24.52	-0.44	20	20	-	-
TH931	0.549	0.659	0.55	1.00	0.55	0	32	Ø40	0.68	0.019	23.83	23.82	-1.03	20	20	-	-
TH932	3.933	4.72	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	23.82	23.33	-0.44	20	20	-	-
TH933	4.155	4.986	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	23.33	22.82	-0.44	20	20	-	-
TH934	2.45	2.94	0.1	1.00	0.1	-2.45	12	Ø16	0.88	0.103	22.82	24.97	-0.44	20	20	-	-
TH935	0.218	0.262	0.1	1.00	0.1	0	12	Ø16	0.88	0.103	24.97	24.95	-0.44	20	20	-	-
TH936	0.428	0.513	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.103	23.95	23.69	-0.44	20	20	-	-
TH937	2.524	3.029	0.45	1.00	0.45	-1.75	26	Ø32	0.85	0.036	23.82	25.46	-0.86	20	20	-	-
TH938	5.875	7.05	0.65	0.72	0.47	-1.75	26	Ø32	0.88	0.039	23.93	25.41	-0.86	20	20	-	-
TH939	0.491	0.589	0.65	0.72	0.47	0	26	Ø32	0.88	0.039	25.41	25.38	-0.86	20	20	-	-
TH940	0.241	0.289	0.65	0.67	0.44	0	26	Ø32	0.83	0.034	24.38	24.37	-0.86	20	20	-	-
TH941	0.698	0.837	0.5	0.77	0.38	0	26	Ø32	0.72	0.027	24.37	24.35	-0.86	20	20	-	-
TH942	0.615	0.738	0.35	1.00	0.35	0	26	Ø32	0.66	0.023	24.35	24.33	-0.86	20	20	-	-
TH943	1.336	1.603	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	24.33	24.28	-0.68	20	20	-	-
TH944	5.01	6.012	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	24.28	24.1	-0.68	20	20	-	-
TH945	1.035	1.241	0.2	1.00	0.2	0	20	Ø25	0.64	0.03	24.1	24.06	-0.68	20	20	-	-
TH946	0.332	0.399	0.15	1.00	0.15	-0.2	15.5	Ø20	0.79	0.062	24.33	24.51	-0.55	20	20	-	-
TH947	0.332	0.399	0.15	1.00	0.15	-0.2	15.5	Ø20	0.79	0.062	24.35	24.53	-0.55	20	20	-	-
TH948	0.332	0.399	0.15	1.00	0.15	-0.2	15.5	Ø20	0.79	0.062	24.37	24.55	-0.55	20	20	-	-
TH949	1.383	1.66	1	0.60	0.6	-1.25	32	Ø40	0.75	0.022	24.02	25.24	-1.04	20	20	-	-
TH950	8.888	10.666	1.5	0.51	0.76	-2.45	32	Ø40	0.95	0.034	24.08	26.17	-1.04	20	20	-	-
TH951	0.758	0.91	1.5	0.45	0.67	0	32	Ø40	0.84	0.027	25.17	25.14	-1.03	20	20	-	-
TH952	0.93	1.117	1.3	0.48	0.63	0	32	Ø40	0.78	0.024	25.14	25.11	-1.03	20	20	-	-
TH953	0.931	1.117	1.1	0.55	0.6	0	32	Ø40	0.75	0.022	25.11	25.09	-1.03	20	20	-	-
TH954	0.834	1.001	0.2	1.00	0.2	0.7	20	Ø25	0.64	0.03	25.09	24.36	-0.68	20	20	-	-
TH955	3.653	4.384	0.9	0.67	0.6	0	32	Ø40	0.75	0.022	25.09	24.99	-1.03	20	20	-	-

Tubagens																	
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ert} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH956	0.792	0.95	0.3	1.00	0.3	0.7	20	Ø25	0.95	0.062	24.99	24.23	-0.68	20	20	-	-
TH957	2.524	3.029	0.6	1.00	0.6	0	32	Ø40	0.75	0.022	24.99	24.93	-1.03	20	20	-	-
TH958	0.792	0.95	0.3	1.00	0.3	0.7	20	Ø25	0.95	0.062	24.93	24.17	-0.68	20	20	-	-
TH959	2.379	2.855	0.3	1.00	0.3	0.7	20	Ø25	0.95	0.062	24.93	24.05	-0.68	20	20	-	-
TH960	0.834	1.001	0.2	1.00	0.2	0.7	20	Ø25	0.64	0.03	25.11	24.38	-0.68	20	20	-	-
TH961	0.834	1.001	0.2	1.00	0.2	0.7	20	Ø25	0.64	0.03	25.14	24.41	-0.68	20	20	-	-
TH962	2.45	2.94	0.3	1.00	0.3	-2.45	20	Ø25	0.95	0.062	24.23	26.5	-0.69	20	20	-	-
TH963	0.07	0.084	0.3	1.00	0.3	0	20	Ø25	0.95	0.062	26.5	26.49	-0.69	20	20	-	-
TH964	0.7	0.84	0.3	1.00	0.3	0.7	20	Ø25	0.95	0.062	26.49	25.74	-0.69	20	20	-	-
TH965	102.218	122.662	1.2	0.56	0.67	0	35.2	Ø40	0.69	0.017	27.88	25.79	-1.17	20	20.1	-	-
TH966	13.359	16.031	0.3	1.00	0.3	0.8	20	Ø25	0.95	0.062	25.79	24	-0.65	20.1	20.1	-	-
TH967	0.313	0.376	0.3	1.00	0.3	0	20	Ø25	0.95	0.062	23	22.98	-0.64	20.1	20.1	-	-
TH968	0.7	0.84	0.3	1.00	0.3	0.7	20	Ø25	0.95	0.062	22.98	22.23	-0.64	20.1	20.1	-	-
TH969	9.816	11.779	0.9	0.67	0.6	0	28	Ø32	0.97	0.042	25.79	25.3	-0.89	20.1	20.1	-	-
TH970	13.361	16.033	0.3	1.00	0.3	0.8	20	Ø25	0.95	0.062	25.3	23.51	-0.65	20.1	20.1	-	-
TH971	0.312	0.374	0.3	1.00	0.3	0	20	Ø25	0.95	0.062	22.51	22.49	-0.64	20.1	20.1	-	-
TH972	0.7	0.84	0.3	1.00	0.3	0.7	20	Ø25	0.95	0.062	22.49	21.73	-0.64	20.1	20.1	-	-
TH973	11.081	13.298	0.6	1.00	0.6	0	28	Ø32	0.97	0.042	25.3	24.74	-0.88	20.1	20.1	-	-
TH974	13.334	16.001	0.3	1.00	0.3	0.8	20	Ø25	0.95	0.062	24.74	22.96	-0.64	20.1	20.1	-	-
TH975	0.339	0.407	0.3	1.00	0.3	0	20	Ø25	0.95	0.062	21.96	21.93	-0.64	20.1	20.1	-	-
TH976	0.7	0.84	0.3	1.00	0.3	0.7	20	Ø25	0.95	0.062	21.93	21.18	-0.64	20.1	20.1	-	-
TH977	18.424	22.109	0.3	1.00	0.3	1.666	20	Ø25	0.95	0.062	24.74	21.71	-0.64	20.1	20.1	-	-
TH978	0.171	0.205	0.3	1.00	0.3	-0.171	20	Ø25	0.95	0.062	20.71	20.87	-0.63	20.1	20.1	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{iscl} (mm)	E_{isol} (mm)
TH979	8.449	10.139	1.7	0.42	0.72	2.85	32	Ø40	0.89	0.026	26.67	23.56	75.07	60	59.7	-	-
TH980	7.367	8.841	1.7	0.42	0.72	0	32	Ø40	0.89	0.026	23.56	23.33	74.28	59.7	59.5	-	-
TH981	4.515	5.418	1.05	0.53	0.56	0	32	Ø40	0.7	0.017	23.33	23.24	73.6	59.5	59.3	-	-
TH982	6.877	8.252	0.3	0.98	0.29	-2.55	20	Ø25	0.94	0.05	23.24	25.38	50.78	59.3	58.9	-	-
TH983	0.37	0.444	0.3	0.98	0.29	0	20	Ø25	0.94	0.051	25.38	25.35	50.03	58.9	58.8	-	-
TH984	0.935	1.121	0.2	1.00	0.2	0	20	Ø25	0.64	0.025	25.35	25.32	49.99	58.8	58.8	-	-
TH985	1.297	1.556	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	25.32	24.99	32.97	58.8	58.6	-	-
TH986	0.359	0.431	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	25.32	25.09	32.97	58.8	58.7	-	-
TH987	0.359	0.431	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	25.35	25.12	33.07	58.8	58.8	-	-
TH988	4.334	5.201	0.75	0.63	0.47	0	26	Ø32	0.89	0.033	23.24	23.07	62.77	59.3	59.1	-	-
TH989	2.671	3.206	0.75	0.63	0.47	-2.6	26	Ø32	0.89	0.033	23.07	25.56	62.32	59.1	58.9	-	-
TH990	0.088	0.106	0.75	0.63	0.47	0	26	Ø32	0.89	0.033	25.56	25.56	62.05	58.9	58.9	-	-
TH991	0.274	0.329	0.75	0.63	0.47	0	26	Ø32	0.89	0.033	24.56	24.55	62.04	58.9	58.9	-	-
TH992	0.64	0.768	0.65	0.67	0.44	0	26	Ø32	0.83	0.029	24.55	24.53	62.01	58.9	58.9	-	-
TH993	0.31	0.372	0.2	1.00	0.2	0	20	Ø25	0.64	0.025	24.53	24.52	50.11	58.9	58.9	-	-
TH994	1.26	1.512	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.086	24.52	24.14	33.11	58.9	58.7	-	-
TH995	0.307	0.368	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.086	24.52	24.23	33.11	58.9	58.8	-	-
TH996	0.568	0.682	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	24.53	24.51	61.94	58.9	58.9	-	-
TH997	1.787	2.144	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.052	24.51	22.65	40.69	58.9	58.7	-	-
TH998	0.743	0.891	0.3	1.00	0.3	0	20	Ø25	0.95	0.052	24.51	24.47	50.05	58.9	58.8	-	-

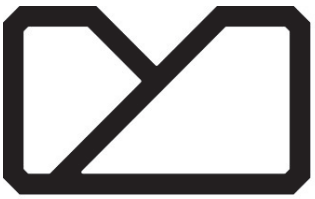
Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH999	1.785	2.141	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.052	24.47	22.6	40.62	58.8	58.7	-	-
TH1000	2.911	3.494	0.15	1.00	0.15	1.75	15.5	Ø20	0.79	0.052	24.47	22.53	40.62	58.8	58.6	-	-
TH1001	0.283	0.34	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.086	24.55	24.27	33.18	58.9	58.9	-	-
TH1002	0.129	0.155	0.65	0.67	0.44	0	26	Ø32	0.83	0.029	23.33	23.33	63.23	59.5	59.4	-	-
TH1003	17.909	21.491	0.65	0.67	0.44	0	26	Ø32	0.83	0.029	23.33	22.7	63.21	59.4	58.6	-	-
TH1004	2.909	3.49	0.65	0.67	0.44	-2.55	26	Ø32	0.83	0.029	22.7	25.15	61.22	58.6	58.4	-	-
TH1005	1.917	2.3	0.5	0.77	0.38	0	26	Ø32	0.72	0.023	25.15	25.1	60.91	58.4	58.3	-	-
TH1006	1.403	1.683	0.35	0.91	0.32	0	26	Ø32	0.6	0.017	25.1	25.07	60.67	58.3	58.3	-	-
TH1007	0.58	0.696	0.15	1.00	0.15	0	15.5	Ø20	0.79	0.052	25.07	25.03	39.75	58.3	58.2	-	-
TH1008	1.882	2.258	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.052	24.03	22.22	39.68	58.2	58	-	-
TH1009	4.597	5.517	0.2	1.00	0.2	0	20	Ø25	0.64	0.025	25.07	24.93	48.9	58.3	57.9	-	-
TH1010	0.053	0.063	0.2	1.00	0.2	0	20	Ø25	0.64	0.025	24.93	24.93	48.2	57.9	57.9	-	-
TH1011	0.581	0.697	0.2	1.00	0.2	0	20	Ø25	0.64	0.025	23.93	23.91	48.2	57.9	57.8	-	-
TH1012	0.046	0.055	0.1	1.00	0.1	0	12	Ø16	0.88	0.086	23.91	23.91	31.81	57.8	57.8	-	-
TH1013	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	23.91	23.69	31.8	57.8	57.8	-	-
TH1014	1.465	1.758	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	23.91	23.56	31.81	57.8	57.7	-	-
TH1015	0.283	0.34	0.15	1.00	0.15	0	15.5	Ø20	0.79	0.052	25.1	25.08	39.89	58.3	58.3	-	-
TH1016	1.883	2.26	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.052	24.08	22.26	39.85	58.3	58.2	-	-
TH1017	0.39	0.468	0.15	1.00	0.15	0	15.5	Ø20	0.79	0.052	25.15	25.13	40.05	58.4	58.4	-	-
TH1018	1.922	2.306	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.052	24.13	22.31	39.99	58.4	58.2	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH1019	1.5	1.8	6.5	0.22	1.43	1.5	51	Ø63	0.7	0.009	26.18	24.66	104.37	60	60	-	-
TH1020	6.929	8.315	6.5	0.22	1.43	1.35	51	Ø63	0.7	0.009	24.66	23.23	104.24	60	59.8	-	-
TH1021	0.75	0.9	5.7	0.23	1.33	0	51	Ø63	0.65	0.008	23.23	23.22	103.63	59.8	59.8	-	-
TH1022	5.984	7.181	1.4	0.46	0.65	0	32	Ø40	0.81	0.022	23.22	23.07	74.47	59.8	59.5	-	-
TH1023	0.119	0.143	1.4	0.46	0.65	0	32	Ø40	0.81	0.022	23.07	23.06	73.86	59.5	59.5	-	-
TH1024	1.385	1.661	0.7	0.65	0.46	0	26	Ø32	0.86	0.031	23.06	23.01	63.44	59.5	59.5	-	-
TH1025	2.732	3.279	0.7	0.65	0.46	-2.55	26	Ø32	0.86	0.031	23.01	25.46	63.29	59.5	59.4	-	-
TH1026	0.115	0.138	0.7	0.65	0.46	0	26	Ø32	0.86	0.031	24.46	24.46	62.99	59.4	59.3	-	-
TH1027	0.273	0.327	0.3	0.98	0.29	0	20	Ø25	0.94	0.05	24.46	24.44	50.96	59.3	59.3	-	-
TH1028	1.09	1.308	0.2	1.00	0.2	0	20	Ø25	0.64	0.025	24.44	24.41	50.93	59.3	59.2	-	-
TH1029	0.312	0.375	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	24.41	24.17	33.57	59.2	59.2	-	-
TH1030	1.317	1.58	0.1	1.00	0.1	0.1	12	Ø16	0.88	0.086	24.41	24.17	33.57	59.2	59.1	-	-
TH1031	0.304	0.365	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	24.44	24.21	33.69	59.3	59.3	-	-
TH1032	3.895	4.674	0.4	1.00	0.4	0	26	Ø32	0.75	0.025	24.46	24.34	62.98	59.3	59.1	-	-
TH1033	1.922	2.306	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.052	24.34	22.52	41.11	59.1	59	-	-
TH1034	4.743	5.691	0.25	1.00	0.25	0.2	20	Ø25	0.8	0.038	24.34	23.93	50.57	59.1	58.8	-	-
TH1035	10.722	12.866	0.7	0.65	0.46	0	26	Ø32	0.86	0.031	23.06	22.66	63.44	59.5	59	-	-
TH1036	3.809	4.571	0.7	0.65	0.46	-2.5	26	Ø32	0.86	0.031	22.66	25.02	62.28	59	58.9	-	-
TH1037	0.551	0.662	0.3	0.98	0.29	0	20	Ø25	0.94	0.051	25.02	24.99	50.06	58.9	58.8	-	-
TH1038	0.746	0.895	0.2	1.00	0.2	0	20	Ø25	0.64	0.025	24.99	24.97	50	58.8	58.8	-	-
TH1039	1.562	1.875	0.1	1.00	0.1	0.05	12	Ø16	0.88	0.086	24.97	24.75	32.99	58.8	58.6	-	-

Tubagens																	
Referência	L_r (m)	L_{ec} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ert} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH1040	0.452	0.543	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	24.97	24.77	32.99	58.8	58.7	-	-
TH1041	0.473	0.568	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	24.99	24.79	33.07	58.8	58.8	-	-
TH1042	2.97	3.564	0.4	1.00	0.4	0	26	Ø32	0.75	0.025	25.02	24.93	61.88	58.9	58.7	-	-
TH1043	1.832	2.198	0.15	1.00	0.15	1.65	15.5	Ø20	0.79	0.052	24.93	23.17	40.46	58.7	58.6	-	-
TH1044	2.479	2.975	0.25	1.00	0.25	-0.35	20	Ø25	0.8	0.038	24.93	25.17	49.77	58.7	58.6	-	-
TH1045	2.488	2.986	0.25	1.00	0.25	0.5	20	Ø25	0.8	0.038	25.17	24.56	49.46	58.6	58.4	-	-
TH1046	8.25	9.899	4.3	0.27	1.14	0	41	Ø50	0.87	0.018	23.22	23.04	90.36	59.8	59.6	-	-
TH1047	1.53	1.836	3.75	0.28	1.06	0	41	Ø50	0.8	0.016	23.04	23.01	89.66	59.6	59.5	-	-
TH1048	3.165	3.798	0.55	0.73	0.4	-2.5	26	Ø32	0.76	0.025	23.01	25.42	63.37	59.5	59.3	-	-
TH1049	0.2	0.24	0.55	0.73	0.4	0	26	Ø32	0.76	0.025	25.42	25.41	62.99	59.3	59.3	-	-
TH1050	0.143	0.172	0.55	0.73	0.4	0	26	Ø32	0.76	0.025	24.41	24.41	62.96	59.3	59.3	-	-
TH1051	1.164	1.397	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	24.41	24.38	62.94	59.3	59.3	-	-
TH1052	0.922	1.106	0.35	1.00	0.35	0	26	Ø32	0.66	0.019	24.38	24.36	62.79	59.3	59.2	-	-
TH1053	1.498	1.798	0.25	1.00	0.25	0.15	20	Ø25	0.8	0.038	24.36	24.14	50.69	59.2	59.1	-	-
TH1054	0.378	0.453	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	24.36	24.17	33.54	59.2	59.2	-	-
TH1055	0.378	0.453	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	24.38	24.19	33.61	59.3	59.2	-	-
TH1056	0.268	0.322	0.1	1.00	0.1	0.05	12	Ø16	0.88	0.086	24.41	24.33	33.69	59.3	59.3	-	-
TH1057	2.136	2.563	3.2	0.31	0.99	0	41	Ø50	0.75	0.014	23.01	22.98	89.53	59.5	59.5	-	-
TH1058	0.864	1.036	0.7	0.65	0.46	-0.15	26	Ø32	0.86	0.031	22.98	23.1	63.22	59.5	59.4	-	-
TH1059	2.35	2.82	0.7	0.65	0.46	-2.35	26	Ø32	0.86	0.031	23.1	25.36	63.13	59.4	59.3	-	-
TH1060	0.227	0.272	0.7	0.65	0.46	0	26	Ø32	0.86	0.031	25.36	25.35	62.88	59.3	59.3	-	-
TH1061	0.139	0.166	0.7	0.65	0.46	0	26	Ø32	0.86	0.031	24.35	24.34	62.85	59.3	59.3	-	-
TH1062	0.085	0.102	0.55	0.73	0.4	0	26	Ø32	0.76	0.025	24.34	24.34	62.84	59.3	59.3	-	-
TH1063	0.237	0.284	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	24.34	24.17	33.63	59.3	59.3	-	-
TH1064	1.192	1.431	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	24.34	24.31	62.83	59.3	59.2	-	-
TH1065	0.237	0.284	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	24.31	24.14	33.54	59.2	59.2	-	-
TH1066	4.498	5.398	0.35	1.00	0.35	0	26	Ø32	0.66	0.019	24.31	24.21	62.67	59.2	58.9	-	-
TH1067	9.37	11.245	0.25	1.00	0.25	0.15	20	Ø25	0.8	0.038	24.21	23.63	50.19	58.9	58.3	-	-
TH1068	0.196	0.235	0.1	1.00	0.1	0.05	12	Ø16	0.88	0.086	24.21	24.14	33.2	58.9	58.9	-	-
TH1069	4.976	5.971	0.15	1.00	0.15	1.65	15.5	Ø20	0.79	0.052	24.34	22.39	41.34	59.3	58.8	-	-
TH1070	5.295	6.354	2.5	0.35	0.88	0	41	Ø50	0.66	0.011	22.98	22.91	89.32	59.5	59.3	-	-
TH1071	2.179	2.615	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	22.91	22.85	62.8	59.3	59.1	-	-
TH1072	2.544	3.053	0.45	0.81	0.36	-2.5	26	Ø32	0.68	0.021	22.85	25.29	62.51	59.1	59	-	-
TH1073	0.067	0.081	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	25.29	25.29	62.17	59	59	-	-
TH1074	0.086	0.103	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	24.29	24.29	62.16	59	59	-	-
TH1075	0.463	0.555	0.35	0.91	0.32	0	26	Ø32	0.6	0.017	24.29	24.28	62.15	59	59	-	-
TH1076	0.931	1.117	0.25	1.00	0.25	0	20	Ø25	0.8	0.038	24.28	24.23	50.22	59	58.9	-	-
TH1077	1.047	1.256	0.15	1.00	0.15	0	15.5	Ø20	0.79	0.052	24.23	24.17	40.74	58.9	58.8	-	-
TH1078	1.825	2.19	0.15	1.00	0.15	1.65	15.5	Ø20	0.79	0.052	24.17	22.41	40.59	58.8	58.6	-	-
TH1079	0.321	0.385	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	24.23	24.05	33.14	58.9	58.9	-	-
TH1080	0.321	0.385	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	24.28	24.09	33.22	59	58.9	-	-
TH1081	3.747	4.497	0.1	1.00	0.1	0	12	Ø16	0.88	0.086	24.29	23.9	33.26	59	58.6	-	-
TH1082	0.05	0.06	0.1	1.00	0.1	0.05	12	Ø16	0.88	0.086	23.9	23.84	32.74	58.6	58.6	-	-
TH1083	8.716	10.459	2.05	0.39	0.79	0	32	Ø40	0.98	0.031	22.91	22.58	73.12	59.3	59	-	-
TH1084	0.072	0.087	0.7	0.65	0.46	0	26	Ø32	0.86	0.031	22.58	22.58	62.18	59	59	-	-
TH1085	3.03	3.636	0.7	0.65	0.46	-2.5	26	Ø32	0.86	0.031	22.58	24.97	62.17	59	58.9	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ent} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH1086	0.179	0.215	0.7	0.65	0.46	0	26	Ø32	0.86	0.031	24.97	24.96	61.85	58.9	58.9	-	-
TH1087	0.106	0.127	0.7	0.65	0.46	0	26	Ø32	0.86	0.031	23.96	23.96	61.84	58.9	58.8	-	-
TH1088	0.294	0.353	0.6	0.70	0.42	0	26	Ø32	0.79	0.027	23.96	23.95	61.82	58.8	58.8	-	-
TH1089	0.476	0.571	0.5	0.80	0.4	0	26	Ø32	0.75	0.025	23.95	23.93	61.79	58.8	58.8	-	-
TH1090	3.31	3.972	0.4	1.00	0.4	0	26	Ø32	0.75	0.025	23.93	23.84	61.73	58.8	58.6	-	-
TH1091	1.924	2.309	0.15	1.00	0.15	1.65	15.5	Ø20	0.79	0.052	23.84	22.07	40.34	58.6	58.5	-	-
TH1092	5.767	6.92	0.25	1.00	0.25	0.15	20	Ø25	0.8	0.038	23.84	23.42	49.62	58.6	58.3	-	-
TH1093	0.25	0.3	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	23.93	23.76	33.03	58.8	58.8	-	-
TH1094	2.962	3.554	0.1	1.00	0.1	0.05	12	Ø16	0.88	0.086	23.95	23.59	33.06	58.8	58.5	-	-
TH1095	0.265	0.318	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	23.96	23.78	33.08	58.8	58.8	-	-
TH1096	8.647	10.376	1.35	0.47	0.64	0	32	Ø40	0.79	0.021	22.58	22.37	72.41	59	58.7	-	-
TH1097	0.344	0.413	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	22.37	22.36	61.43	58.7	58.7	-	-
TH1098	0.028	0.034	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	22.36	22.36	61.38	58.7	58.7	-	-
TH1099	2.561	3.073	0.45	0.81	0.36	-2.422	26	Ø32	0.68	0.021	22.36	24.71	61.38	58.7	58.5	-	-
TH1100	0.128	0.154	0.45	0.81	0.36	-0.128	26	Ø32	0.68	0.021	23.71	23.84	61.04	58.5	58.5	-	-
TH1101	0.042	0.05	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	23.84	23.84	61.03	58.5	58.5	-	-
TH1102	0.387	0.465	0.2	1.00	0.2	0	20	Ø25	0.64	0.025	23.84	23.83	49.36	58.5	58.5	-	-
TH1103	0.377	0.453	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	23.83	23.59	32.6	58.5	58.4	-	-
TH1104	1.392	1.67	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	23.83	23.48	32.6	58.5	58.3	-	-
TH1105	0.746	0.895	0.25	1.00	0.25	0	20	Ø25	0.8	0.038	23.84	23.8	49.36	58.5	58.5	-	-
TH1106	0.236	0.284	0.1	1.00	0.1	0.1	12	Ø16	0.88	0.086	23.8	23.68	32.58	58.5	58.4	-	-
TH1107	5.168	6.202	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.052	23.8	21.78	40.05	58.5	58	-	-
TH1108	7.598	9.117	0.9	0.58	0.52	0	26	Ø32	0.98	0.039	22.37	22.01	61.43	58.7	58.4	-	-
TH1109	0.84	1.009	0.9	0.58	0.52	-0.05	26	Ø32	0.98	0.039	22.01	22.02	60.73	58.4	58.3	-	-
TH1110	2.55	3.06	0.45	0.81	0.36	-2.55	26	Ø32	0.68	0.021	22.02	24.5	60.66	58.3	58.2	-	-
TH1111	0.206	0.247	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	24.5	24.5	60.33	58.2	58.2	-	-
TH1112	0.229	0.275	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	23.5	23.49	60.31	58.2	58.2	-	-
TH1113	0.152	0.183	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	23.49	23.33	32.24	58.2	58.2	-	-
TH1114	1.118	1.342	0.35	0.91	0.32	0	26	Ø32	0.6	0.017	23.49	23.47	60.28	58.2	58.1	-	-
TH1115	0.269	0.323	0.1	1.00	0.1	0.25	12	Ø16	0.88	0.086	23.47	23.19	32.15	58.1	58.1	-	-
TH1116	0.966	1.16	0.25	1.00	0.25	0.05	20	Ø25	0.8	0.038	23.47	23.38	48.62	58.1	58	-	-
TH1117	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	23.38	23.16	32.07	58	58	-	-
TH1118	2.878	3.453	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.052	23.38	21.5	39.42	58	57.8	-	-
TH1119	2.927	3.513	0.45	0.81	0.36	-2.5	26	Ø32	0.68	0.021	22.02	24.44	60.66	58.3	58.2	-	-
TH1120	0.079	0.095	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	24.44	24.44	60.29	58.2	58.2	-	-
TH1121	0.406	0.487	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	23.44	23.43	60.28	58.2	58.2	-	-
TH1122	0.117	0.14	0.1	1.00	0.1	0.1	12	Ø16	0.88	0.086	23.43	23.32	32.21	58.2	58.1	-	-
TH1123	1.126	1.351	0.35	0.91	0.32	0	26	Ø32	0.6	0.017	23.43	23.41	60.22	58.2	58.1	-	-
TH1124	0.934	1.121	0.25	1.00	0.25	0	20	Ø25	0.8	0.038	23.41	23.37	48.57	58.1	58	-	-
TH1125	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	23.37	23.15	32.04	58	58	-	-
TH1126	2.863	3.435	0.15	1.00	0.15	1.7	15.5	Ø20	0.79	0.052	23.37	21.49	39.39	58	57.8	-	-
TH1127	0.2	0.24	0.1	1.00	0.1	0.2	12	Ø16	0.88	0.086	23.41	23.19	32.12	58.1	58.1	-	-
TH1128	8.411	10.093	0.55	0.73	0.4	-2.5	26	Ø32	0.76	0.025	23.04	25.29	63.47	59.6	59.1	-	-
TH1129	0.138	0.165	0.55	0.73	0.4	0	26	Ø32	0.76	0.025	25.29	25.29	62.44	59.1	59.1	-	-
TH1130	0.383	0.459	0.55	0.73	0.4	0	26	Ø32	0.76	0.025	24.29	24.28	62.43	59.1	59.1	-	-
TH1131	1.01	1.212	0.45	0.81	0.36	0	26	Ø32	0.68	0.021	24.28	24.25	62.38	59.1	59	-	-

Tubagens																	
Referência	L_r (m)	L_{eq} (m)	Q_b (l/s)	K	Q_c (l/s)	h (m)	D_{int} (mm)	D_{com} (mm)	v (m/s)	J (mca/m)	P_{ent} (mca)	P_{sai} (mca)	E_p (W/m)	T_{ert} (°C)	T_{sai} (°C)	D_{isol} (mm)	E_{isol} (mm)
TH1132	1.052	1.263	0.35	1.00	0.35	0	26	Ø32	0.66	0.019	24.25	24.23	62.25	59	59	-	-
TH1133	0.229	0.275	0.1	1.00	0.1	0.05	12	Ø16	0.88	0.086	24.23	24.15	33.23	59	58.9	-	-
TH1134	3.547	4.257	0.25	1.00	0.25	0.15	20	Ø25	0.8	0.038	24.23	23.92	50.24	59	58.7	-	-
TH1135	0.381	0.457	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	24.25	24.06	33.31	59	59	-	-
TH1136	0.328	0.393	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	24.28	24.09	33.39	59.1	59.1	-	-
TH1137	53.118	63.742	0.8	0.61	0.49	0	26	Ø32	0.92	0.035	23.23	20.99	64.03	59.8	57.5	-	-
TH1138	10.53	12.636	0.5	0.77	0.38	0	26	Ø32	0.72	0.023	20.99	20.7	58.67	57.5	56.9	-	-
TH1139	0.22	0.264	0.5	0.77	0.38	0	26	Ø32	0.72	0.023	20.7	20.69	57.46	56.9	56.9	-	-
TH1140	2.732	3.278	0.2	1.00	0.2	-2.5	20	Ø25	0.64	0.026	20.69	23.11	46.42	56.9	56.7	-	-
TH1141	0.532	0.639	0.2	1.00	0.2	0	20	Ø25	0.64	0.026	23.11	23.09	46.04	56.7	56.7	-	-
TH1142	0.746	0.895	0.2	1.00	0.2	0	20	Ø25	0.64	0.026	22.09	22.07	45.96	56.7	56.6	-	-
TH1143	0.329	0.394	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.087	22.07	21.89	30.31	56.6	56.6	-	-
TH1144	1.67	2.004	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.087	22.07	21.75	30.31	56.6	56.4	-	-
TH1145	2.639	3.167	0.3	0.98	0.29	0	20	Ø25	0.94	0.051	20.69	20.53	46.42	56.9	56.8	-	-
TH1146	3.674	4.409	0.1	1.00	0.1	-2.5	12	Ø16	0.88	0.087	20.53	22.65	30.52	56.8	56.4	-	-
TH1147	0.273	0.328	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.087	21.65	21.47	30.06	56.4	56.4	-	-
TH1148	1.046	1.256	0.2	1.00	0.2	0	20	Ø25	0.64	0.026	20.53	20.5	46.17	56.8	56.7	-	-
TH1149	7.342	8.811	0.2	1.00	0.2	-2.5	20	Ø25	0.64	0.026	20.5	22.77	46.02	56.7	56.1	-	-
TH1150	0.044	0.053	0.2	1.00	0.2	0	20	Ø25	0.64	0.026	21.77	21.77	45	56.1	56.1	-	-
TH1151	1.594	1.913	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.087	21.77	21.46	29.73	56.1	56	-	-
TH1152	0.307	0.369	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.087	21.77	21.59	29.73	56.1	56.1	-	-
TH1153	4.108	4.929	0.3	1.00	0.3	-2.5	20	Ø25	0.95	0.052	20.99	23.23	47.44	57.5	57.3	-	-
TH1154	0.658	0.79	0.3	1.00	0.3	0	20	Ø25	0.95	0.053	23.23	23.19	47.04	57.3	57.2	-	-
TH1155	0.709	0.851	0.3	1.00	0.3	0	20	Ø25	0.95	0.053	22.19	22.15	46.97	57.2	57.2	-	-
TH1156	0.71	0.853	0.2	1.00	0.2	0.65	20	Ø25	0.64	0.026	22.15	21.47	46.9	57.2	57.1	-	-
TH1157	3.96	4.751	0.1	1.00	0.1	0.15	12	Ø16	0.88	0.086	22.15	21.58	31.01	57.2	56.8	-	-



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