YARWAY NARVIK MODEL 13/23

HEAVY DUTY QUE-TEMP DESUPERHEATER

Yarway covers requirements for desuperheaters, pneumatic actuators, strainers with a wide range of models, sizes and materials to satisfy all the specifications of the power, pulp and paper industry and process gas applications

FEATURES

- Forged construction
- Variable nozzle type
- Wide range of K_v (C_v) capacities available
- Special nozzle combinations available
- Pressure class and connections:
  - ASME B16.34 class 900 to 2500
  - EN 1092-1 class PN 160 to 400
  - Butt weld connections to ASME B16.25 or DIN 2559
- Materials
  - ASTM SA 182 F22 or 1.7383
  - ASTM SA 182 F347H or 1.4550
  - ASTM SA 182 F91 or 1.4903
  - Other materials upon request

GENERAL APPLICATION

Cooling of process steam or gas,
Boiler superheater,
Boiler reheater,
Turbine bleed steam and
Pressure reducing valve.

TECHNICAL DATA

Sizes: Steam NPS 3 (DN 80)
Water NPS 1 - 1½ (DN 25 - 40)
Steam NPS 4 (DN 100)
Water NPS 1½ - 2 - 3 (DN 40 - 50 - 80)

FIG. 1

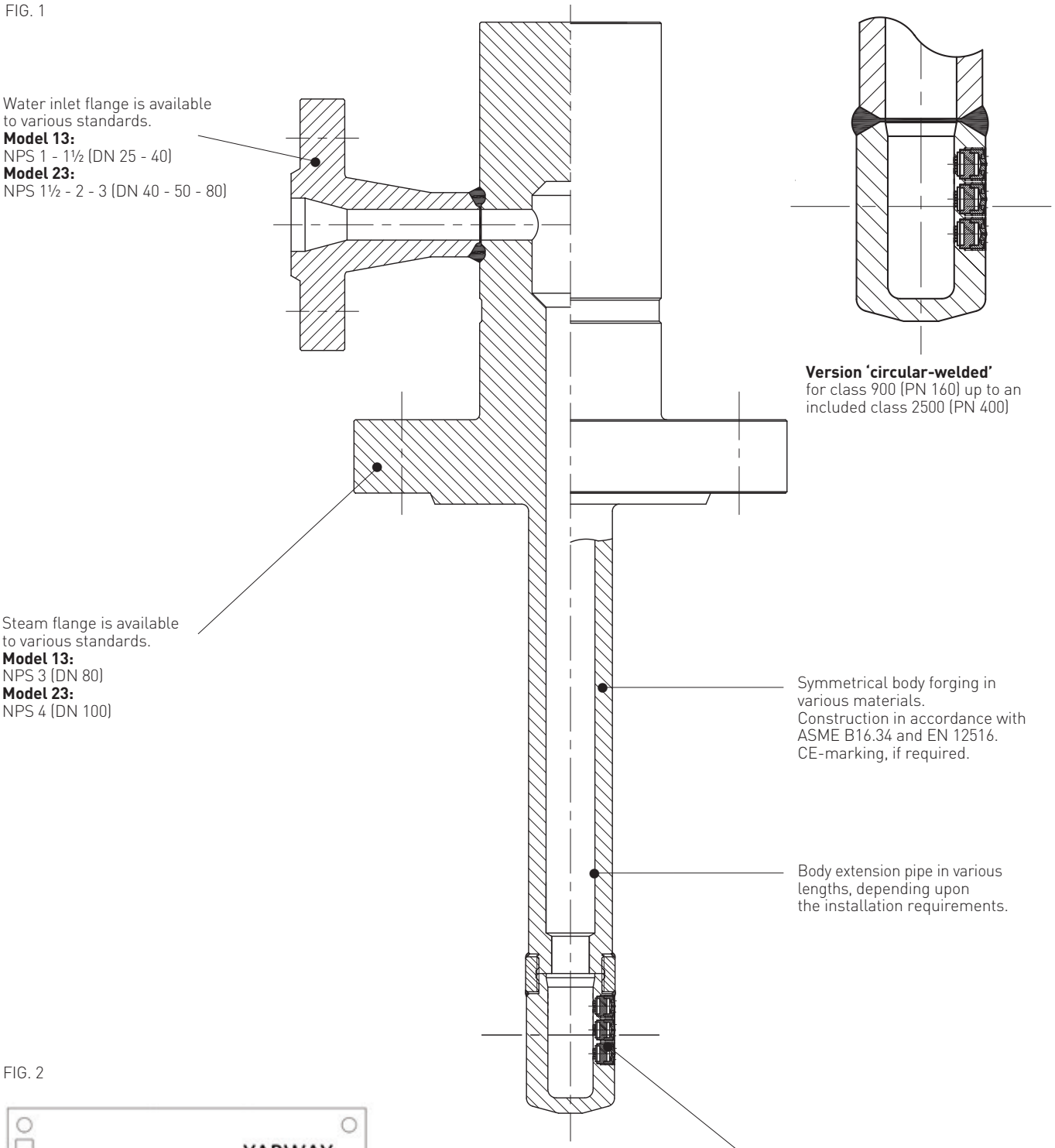
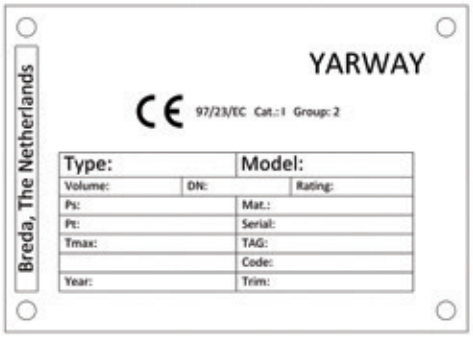

Water inlet flange is available to various standards.
Model 13:
NPS 1 - 1½ (DN 25 - 40)
Model 23:
NPS 1½ - 2 - 3 (DN 40 - 50 - 80)
Version 'circular-welded'
for class 900 (PN 160) up to an included class 2500 (PN 400)
Steam flange is available to various standards.
Model 13:
NPS 3 (DN 80)
Model 23:
NPS 4 (DN 100)
Symmetrical body forging in various materials.
Construction in accordance with ASME B16.34 and EN 12516.
CE-marking, if required.
Body extension pipe in various lengths, depending upon the installation requirements.
High performance spray nozzles give fine atomization of injection water.

FIG. 2


YARWAY
CE 97/23/EC Cat.: I Group: 2
Breda, The Netherlands
Type:
Model:
Volume:
DN:
Rating:
Ps:
Mat.:
Pt:
Serial:
Tmax:
TAG:
Code:
Year:
Trim:

QUE-TEMP DESUPERHEATER

The Yarway Que-Temp Desuperheater is specifically developed for use on medium-, and high pressure steam applications. Its fabricated construction makes it easy adaptable to meet various boiler codes and material specifications.
The unit can also be used as a liquid into gas injector for which high grade alloy such as stainless steel is often used.
The nozzle components are identical to those used in Yarway A.T.-Temp Desuperheater.
More than 3800 units of both Heavy - and Standard Duty A.T.-Temp Desuperheaters are in service today.

APPLICATIONS

Que-Temp Desuperheaters are used for temperature control of: boiler superheaters - boiler reheaters - turbine bleed steam - pressure reducing valve outlet steam - process steam and process gasses.
For system comparison, please see the relevant brochure.

SUPERIOR SPRAY NOZZLE

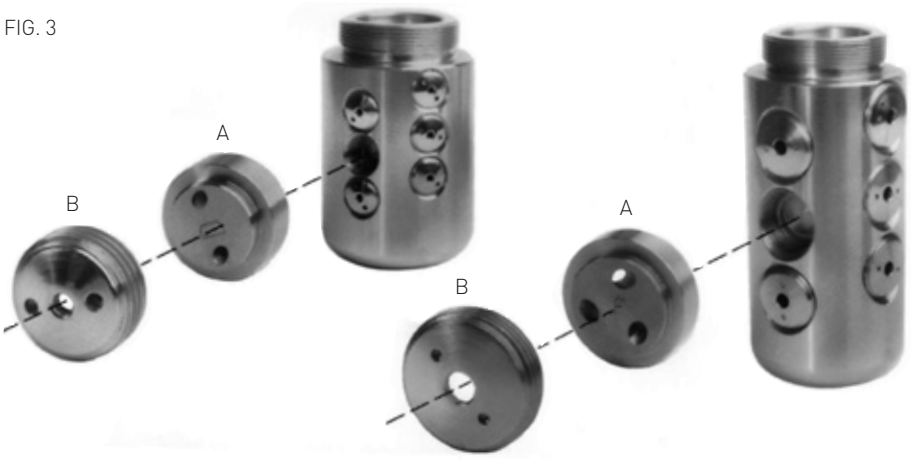
Yarway have incorporated the latest technology in the spray nozzle design.

The high quality surface finish minimizes frictional losses, thereby ensuring that the total water to steam ΔP is available for atomization of the water (see Fig. 3).
The nozzle consists of two components A) the orifices and B) the nozzle body.
Each nozzle is served by individual feed holes in the cylinder wall. Water enters the chamber behind the orifice plate through these openings.
The relatively large volume of this chamber ensures that water is proportioned evenly through each orifice.
The ΔP across this orifice plate results in an increase in the fluid velocity. The water is subsequently rotated in the nozzle chamber before being emitted through the central hole.

The combination of splitting the feed flow, increasing velocity and rotating effect, ensures that the water is injected into the system in a fine symmetrical hollow cone spray.
The nozzles are assembled with the spray cylinder and sealed by a vacuum brazing process. This maintains the integrity of these components even under the most extreme conditions.
Material compatibility of spray cylinder is well proven in hot/cold service conditions, as typically found in steam attemperators. This enables reliable operation over an extended period.
Surfaces are finely machined to reduce frictional losses and internal contours are so designed as to optimize water swirl action, ensuring uniform and consistent droplet size.

Minimum ΔP available from the Que-Temp Desuperheater inlet flange to steam pressure must be:
Nozzles A through Dx: 1 bar
Nozzles E through K: 2 bar

FIG. 3



CODES AND STANDARDS

The Que-Temp Desuperheater is designed and manufactured to meet a wide variety of international codes and standards. Certified acceptance documents are available upon request. If special codes or standards are required by your local authority, then we would be pleased to discuss them.

MULTIPLE NOZZLE HEADS

The Que-Temp Desuperheater may be equipped with a variety of spray heads.
The uniform body threading accepts spray cylinder heads with a wide range of K_v (C_v) values.
Standard configurations are with either 6 or 9 equally sized spray nozzles but combinations are available.
This feature enables the Que-Temp Desuperheater to be customized to specific system requirements. Consult Yarway or your local representative for details.

Size	Que-Temp standard capacity range					
16	6A	C_v = 0.075	K_v = 0.064	9A	C_v = 0.112	K_v = 0.097
	6B	C_v = 0.158	K_v = 0.136	9B	C_v = 0.238	K_v = 0.205
	6C	C_v = 0.300	K_v = 0.259	9C	C_v = 0.451	K_v = 0.389
	6D	C_v = 0.586	K_v = 0.505	9D	C_v = 0.879	K_v = 0.757
	6Dx	C_v = 1.160	K_v = 1.000	9Dx	C_v = 1.740	K_v = 1.500
25	6E	C_v = 1.900	K_v = 1.639	9E	C_v = 2.853	K_v = 2.455
	6F	C_v = 2.839	K_v = 2.448	9F	C_v = 4.259	K_v = 3.672
	6G	C_v = 6.032	K_v = 5.200	9G	C_v = 9.048	K_v = 7.800
	6H	C_v = 9.396	K_v = 8.100	9H	C_v = 14.094	K_v = 12.150
	6K	C_v = 13.488	K_v = 11.628	9K	C_v = 20.232	K_v = 17.442

Definition

$$K_V = Q\sqrt{\frac{S.G}{\Delta p}}$$

Q = m^3/hr
S.G. = kg/dm^3
ΔP = bar

Flow capacity limitations are:

- Model 13 with a maximum water flow capacity of 50 m^3/hr in continuous service
- Model 23 with a maximum water flow capacity of 100 m^3/hr in continuous service

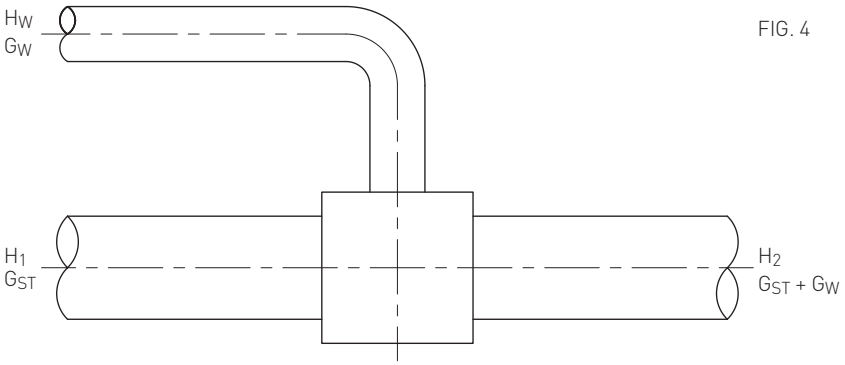


FIG. 4

SIZING FORMULA

Every desuperheating station is a mixing point where there is a heat and mass balance.
The universal formula is:

$G_W = G_{ST} (H_1-H_2) : (H_2-H_W)$

This formula enables calculation of the quantity of water required to lower the inlet steam temperature to the setpoint temperature of the outlet steam.

In which:

G_W = Injection water mass
G_{ST} = Inlet steam mass
H_1 = Enthalpy of the inlet steam
H_2 = Enthalpy of the outlet steam
H_W = Enthalpy of the injection water

IMPORTANT SYSTEM PARAMETERS

Apart from the spray quality of the atomizer (primary atomization) there are other system parameters which influence the desuperheater stations performance. These are:

Inlet steam velocity
At high steam velocities, water droplets are easily disintegrated. This factor contributes to the overall atomization quality (secondary atomization). The minimum acceptable steam velocity varies as a function of the nozzle size and pipe diameter. In case of doubt, consult Yarway.

Water to steam ratio
This ratio is determined by dividing G_W by G_{ST}. For system steam pressures below 15 bar, this ratio should not exceed 5% for the normal operating conditions. Systems operating between 15 and 25 bar can have a ratio of up to 10%. For higher pressure duties, consult Yarway.

Distance to sensor
The distance from the injection point to the temperature sensor should be 12 to 15 meters. Systems operating at pressures above 25 bar can have significantly less run to the sensor, consult Yarway.

Required straight pipe run
The distance from injection point to the first pipe bend is also a function of steam pressure, temperature and nozzle size. Experience has shown that in systems up to 25 bar, 4 to 6 meters, is an acceptable distance.

ORDERING / SIZING DATA

Steam desuperheaters are selected specifically against application data. For optimal sizing, the following comprehensive data should always be supplied.

Steam data

Inlet pressure	bar
Inlet temperature	°C
Outlet temperature	°C setpoint
Steam flow max.	t / hr
Steam flow normal	t / hr
Steam flow min.	t / hr

Water data

Water pressure	bar
Water temperature	°C

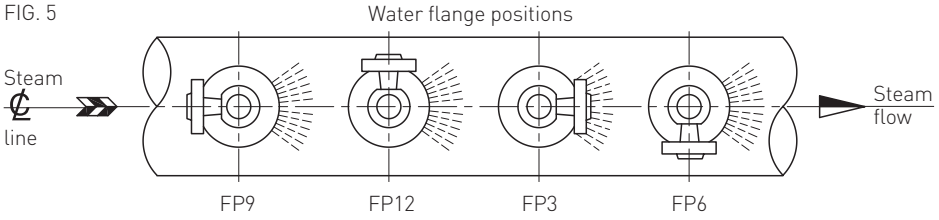
General

Pipe size	mm
Pipe schedule	
Required water flange position	(9) (12) (3) (6)

It is essential not to over specify the required turndown ratio i.e.: $\frac{\text{Steam flow max.}}{\text{Steam flow min.}}$

Otherwise this will necessitate selection of special nozzle heads which are non - stock items. Standard stock consists of nozzles with 6 or 9 equally sized atomizers having turndown ratio approx. 4:1 on the water flow control. Experience shows that the majority of applications fall within this range.

FIG. 5



Spraywater must be injected in the direction of the steam flow. To facilitate installation of the water supply line, 4 different spray head positions are available in relation to the water connecting flange. Specification of this spray head orientation is required with the ordering data.

Yarway always recommends a strainer with a mesh size of approx. 100 µ (400 µ on request) in the water supply line to protect the Que-Temp Desuperheater from clogging.

TABLE 1 - STANDARD MATERIALS

Item	Name	Material	Equivalent
1 + 2	Spray Nozzle assembly	AISI 410 **	1.4006 **
9	Body	SA182 F22	1.7383
		SA182 F347H	1.4550
		SA182 F91 *	1.4903 *
10	Water flange	SA182 F22	1.7383
		SA182 F347H	1.4550
		SA182 F91 *	1.4903 *
14	Nut	A194 4H *	1.4923 *
16	Stud	A193 B16 *	1.4923 *
19	Name plate	SS	SS
23	Securing washer	Steel *	Steel *
25	Spiral wound gasket	St. steel/Graphite *	St. steel/Graphite *

* High temperature model with bolted water flange available upon request. See detail 'B'.

** Welded sprayhead material is simular to body material. Nozzles in Inconel 718.

NOTES

Other materials are available upon request.

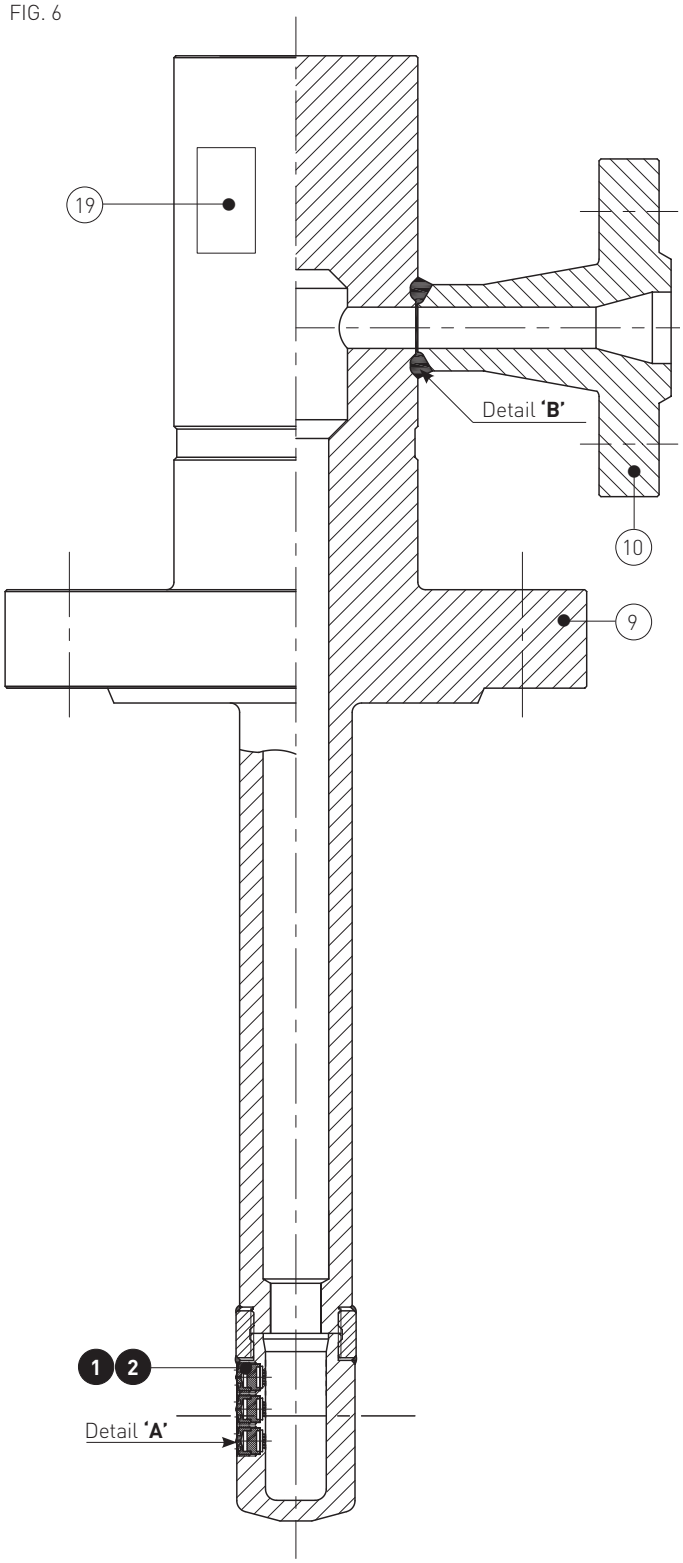
Certification:

Que-Temp Desuperheater is approved by authorized authorities to comply with the requirements of ASME B16.34 and EN 12516.

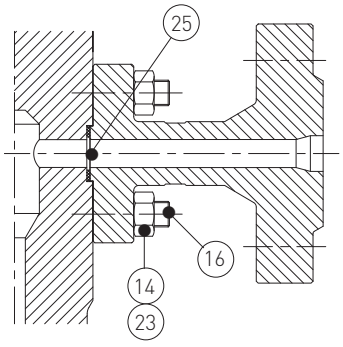
All data subject to changes.

Materials and data of units supplied, may deviated from this brochure. Please consult Order documents in case of doubt.

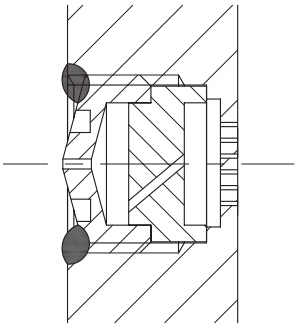
FIG. 6



Detail **'B'**



Detail **'A'**



● Recommended spares
(in case of welded sprayhead, no spares available)

TABLE 2 - DIMENSIONS (mm)

	Standard length for steam line sizes up to 12" (DN 300)	
	Model 13	**Model 23**
	Qmax = 50 m³/hr	**Qmax = 100 m³/hr**
A	A through Dx 380 E through K 399	399
B	A through Dx 436 E through K 476	476
C	200	200
D	305	355
L	Depending on size and pressure class 150	Depending on size and pressure class 200
M min.	68.0	80.0
N	60.3 x 12.6*	73.3 x 14.0**

NOTE

* Class 2500: 61 mm

** Class 2500: 77 mm

Dimensions may be subject to change without prior notification.
Yarway will provide a certified dimensional drawing upon request.

TABLE 3 - FLANGE CONNECTIONS

	Model 13		**Model 23**	
	Qmax = 50 m³/hr		**Qmax = 100 m³/hr**	
Steam flange	NPS 3	class 900 class 1500 class 2500	NPS 4	class 900 class 1500 class 2500
	DN 80	PN 160 PN 250 PN 320 PN 400	DN 100	PN 160 PN 250 PN 320 PN 400
Water flange	NPS 1 - 1½ DN 25 - 40		NPS 1½ - 2 - 3 DN 40 - 50 - 80	
	Pressure classes as per water data requirements		Pressure classes as per water data requirements	

MINIMUM STEAM PIPE SIZE

For nozzles A-B-C-D-Dx: 6" (DN 150)
For nozzles E-F-G-H-K: 8" (DN 200)
In case of smaller pipe size, please consult Yarway.

FIG. 7