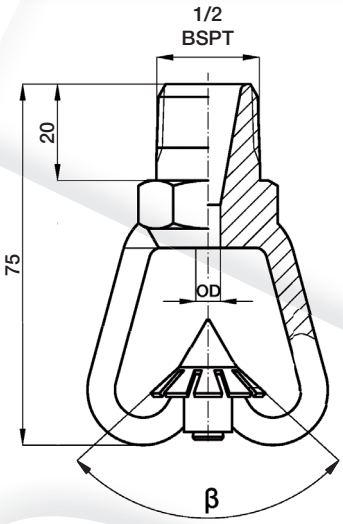
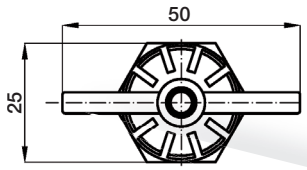
WATER SPRAY NOZZLES

Open sprinklers

RJ series sprinkler nozzles have been designed to perform fire fighting operations when used in fixed spray systems. They produce a directional spray with a conical shape, the spray being made up of medium velocity drops, and are used to protect surfaces of all geometries, avoiding temperature rise and structural damages.
These nozzles can be equipped with different orifice plugs in order to avoid any clogging problem caused by dust, foreign particles or insects.
All RJ type sprinklers are supplied as standard with ½ NPT male thread.

Materials
B31 - AISI 316L stainless steel
T5 - Bronze





Product coding
RJ sprinklers range includes 7 capacitiy values, each one available with 8 different spray angles.
The two tables underneath give (Table 1) the capacity code of each single nozzle for different pressure values and (Table 2) the nozzle code for different spray angles.
Please note the following:

1. The complete nozzle code is made up by three parts, eg RJT – for spray angle identification 2748 – for capacity value T5 – for material, in this case bronze
2. Therefore a complete nozzle code would look as follows: RJT 2748 T5

Table 1

Capacity Code	Capacity Lpm at pressure (bar)					OD
	*1**	*3*	*5*	*7*	*10*	*mm*
2300 T5SB	17.3	30.0	38.7	45.8	54.7	5.16
2449 T5SB	25.9	44.9	57.9	68.5	81.9	6.35
2573 T5SB	33.1	57.3	74.0	87.6	105	7.14
2748 T5SB	43.2	74.8	96.6	114	137	8.33
3102 T5SB	59.0	102	132	156	187	9.53
3140 T5SB	80.6	140	180	213	255	11.1
3180 T5SB	104	180	232	274	328	12.7

** Capacity at 1 bar equals K factor*

Table 2

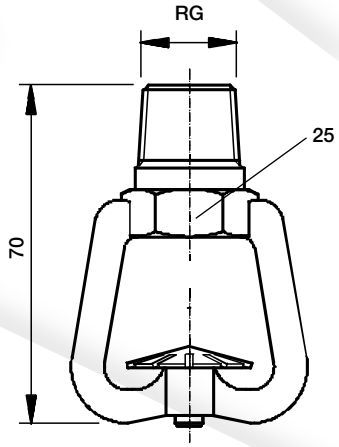
Nozzle code *for spray angle*	Spray angle value *ß*
RJR	65 °
RJT	80 °
RJV	95 °
RJJ	110 °
RJW	125 °
RJY	140 °
RJX	160 °
RJZ	180 °

RJ nozzles carry an UL listing.

Open Sprinklers

RO series sprinkler nozzles produce a full jet spray whose angle can reach very large values, which allows for cooling operations onto very large surfaces.
The same nozzle body can be supplied with both an ½" and a ¾" tapered BSPT thread, while NPT threads are available as an option, as well as copper or stainless inlet filters (see bottom of page for appropriate coding).

Materials
B31 - AISI 316 L stainless steel
T1 - Brass



Thread 1/2"

Code	Capacity Lpm at pressure (bar)					OD
	*1**	*3*	*5*	*7*	*10*	*mm*
ROY 2156 T1SB	9.00	15.6	20.0	24.0	29.0	4.0
ROY 2198 T1SB	11.5	19.8	25.0	30.0	36.0	4.5
ROY 2270 T1SB	15.8	27.0	35.0	42.0	50.0	5.0
ROY 2300 T1SB	18.0	30.0	40.0	48.0	57.0	5.5
ROY 2390 T1SB	23.0	39.0	50.0	60.0	71.0	6.0
ROY 2470 T1SB	27.0	47.0	61.0	72.0	86.0	6.5
ROY 2550 T1SB	31.0	55.0	72.0	84.0	91.0	7.0
ROY 2700 T1SB	41.0	70.0	92.0	112	130	8.0
ROY 2910 T1SB	52.0	91.0	117	140	165	9.0
ROY 3110 T1SB	64.0	110	139	165	200	10.0

** Capacity at 1 Bar in liters per minute equals K factor*

Thread 3/4"

Code	Capacity Lpm at pressure (bar)					OD
	*1**	*3*	*5*	*7*	*10*	*mm*
ROY 2157 T1SB	9.00	15.6	20.0	24.0	29.0	4.00
ROY 2199 T1SB	11.5	19.8	25.0	30.0	36.0	4.50
ROY 2271 T1SB	15.8	27.0	35.0	42.0	50.0	5.00
ROY 2301 T1SB	18.0	30.0	40.0	48.0	57.0	5.50
ROY 2391 T1SB	23.0	39.0	50.0	60.0	71.0	6.00
ROY 2471 T1SB	27.0	47.0	61.0	72.0	86.0	6.50
ROY 2551 T1SB	31.0	55.0	72.0	84.0	91.0	7.00
ROY 2701 T1SB	41.0	70.0	92.0	112	130	8.00
ROY 2911 T1SB	52.0	91.0	117	140	165	9.00
ROY 3111 T1SB	64.0	110	139	165	200	10.0

** Capacity at 1 Bar in liters per minute equals K factor*

Coding for nozzle options
Adding the following codes at the end of standard codes as shown in the above tables, specifies nozzle options as follows

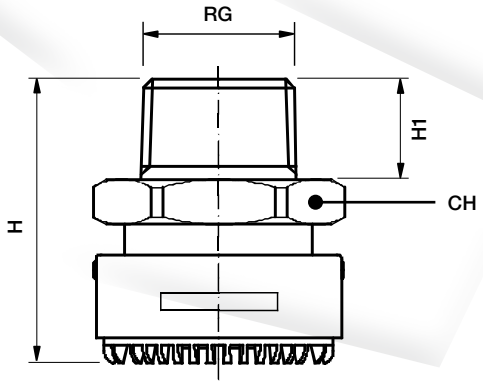
SN	NPT Thread
FB	Copper filter, BSPT thread
FN	Copper filter, NPT thread
GB	Stainless filter, BSPT thread

WATER SPRAY NOZZLES

Full cone adjustable nozzles

Our range of full cone nozzles, series URP, are typically designed to offer design flexibility in fire fighting, applications since offering the advantages of an adjustable flow rate and an adjustable spray angle.
Capacity and spray angle values can be easily preset both at the factory, or right on the installation site.
The wide internal passages allow foreign particles up to 1/8 to be in the feed water, while larger particles must be dealt with by means of a filter or screen on the feed line.

Materials
T1 - Brass
T5 - Bronze
V1 - Aluminum



Code	RG	Capacity Lpm at pressure (bar)					CH	H*	H1	OD
	inches	*1***	*3*	*5*	*7*	*10*	*mm*	*mm*	*mm*	*mm*
URP E070 T1FN	¾”	14.4	24.9	32.1	37.8	45.4	30	45	14	34
URP E071 T1FN		28.7	49.8	64.2	75.6	90.8				
URP E072 T1FN		43.1	74.6	96.3	113	136				
URP H100 T1FN	1”	57.5	99.5	128	151	182	50	70	22	54
URP H102 T1FN		136	236	304	359	430				
URP H103 T1FN		180	311	401	472	568				
URP H150 T1FN	1+ ½”	180	311	401	472	568	50	73	25	54
URP H151 T1FN		251	435	562	661	795				
URP H152 T1FN		359	622	803	945	1135				

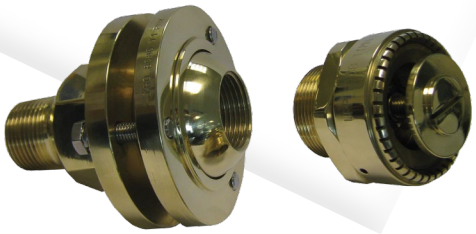
** Height dimension for fully extended nozzle - ** Capacity at 1 bar = K factor - + Capacity values in the table shows typical settings for each siz*

Swivel joints

Swivel joints are designed to accommodate larger size nozzles. The orientation of the unit is fixed by tightening the clamping flanges with bolts. The connection to the feedline is a male thread, while the connection to the nozzle can be male or female.

Max operative pressure
LP 9 bar

Materials
B3 - Stainless Steel AISI 316
T1 - Brass

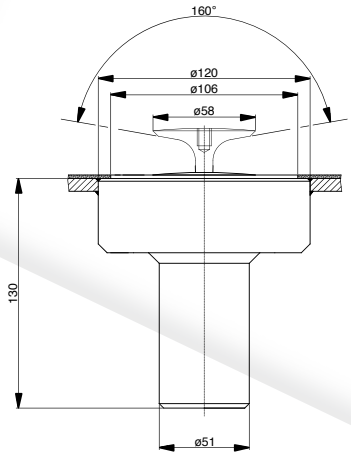


Code	RG	RG1	RF	L	D	A	W
	inches	*inches*	*inches*	*mm*	*mm*	*degrees*	*kg*
ZRQ 8080 xx	1”		1”	89	92	40	1.8
ZRQ 8282 xx	1 ¼”		1 ¼”	130			2.1
ZRQ 8482 xx	1 ½”		1 ¼”	133			2.4
ZRR 8282 xx	1 ¼”	1 ¼”		130	92	40	2.2
ZRR 8284 xx	1 ½”	1 ¼”		130			2.2
ZRR 8484 xx	1 ½”	1 ½”		130			2.4
ZRR 8686 xx	2”	2 ½”		203	158	40	8.0
ZRR 8888 xx	2 ½”	2 ½”		229			8.0

Order code
To have a precise identification of required product, the order code must be completed with this code:
ZRQ 8080 T1 (brass)

Pop-up nozzles

The UMM pop-up nozzles, for cooling and foam-water fire extinguishing system, is specially designed to be fully recessed, which is a key advantage for installation on aircraft carrier's flight deck or other areas that needs surface protection.
This nozzles has been tested for assuring operation after being exposed to a jet engine discarge gases for fifteen minutes.
Inlet water connection: 1 ¼" gas thread.



Technical characteristics

Material	B31 Stainless steel AISI 316L
Operative pressure	6 bar
Flow rate	90 Lpm
Coverage diameter	5.5 meter

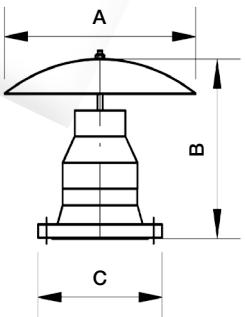
Order code
To have a precise identification of required product, the order code must be completed with this code:

UMM x116 B31	**X**	**B** > Coverage angle 160° **D** > Coverage angle 360°

Mushroom nozzles

The mushroom type nozzle in the URC series are designed for protection of large size tanks, in oil and petrochemical plants.
Their sturdy construction and large size passages can assure for a very high degree of reliability.
Connection can be either by means of thread, or with flanges according to the most popular standards.

Materials
A1 - Mild steel, epoxy painted
B31 - AISI 316 stainless steel



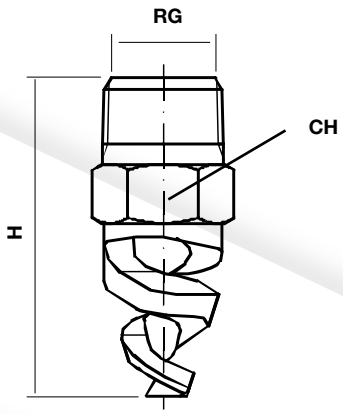
Code	Flow min *At 5 bar*	Flow max *At 5 bar*	A *mm*	B *mm*	C *inches*	Weight *kg*
URC-M001	200	400	235	180	1½"	3.5
URC-M002	400	650	235	200	2"	5.5
URC-M003	800	1500	235	210	3"	7.5
URC-M004	1500	3200	400	285	4"	14
URC-M006	3200	5500	400	335	6"	20

WATER SPRAY NOZZLES

Full cone spiral nozzles

E type spiral nozzles have been designed to offer a very high resistance to clogging dangers, and at the same time an effective spray distribution for the purpose of performing efficient cooling processes.
Their design, in fact, does not require an inside swirl component so that the internal liquid passage is totally free, and the jet spray angle value varies very little even with sensible feed pressure changes.
In addition, thanks to their design, the feed pipe size required is consistently smaller than the one required by conventional swirl nozzles, with the advantages of lower weight and cost.

Materials
B31 - AISI 316L stainless steel
T1 - Brass



	Code	RG	DO	DM	Capacity Lpm at pressure (bar)				CH	H
		inches	*mm*	*mm*	*1**	*3*	*5*	*7*	*mm*	*mm*
90°	ECU 2230 T1SB	3/8"	4,8	3,2	13,6	23,5	30,3	42,8	19	48
	ECU 2317 T1SB		5,6		18,3	31,2	40,9	57,8		
	ECU 2410 T1SB		6,4		24,0	41,5	53,6	75,8		
	ECU 2640 T1SB		7,9		37,7	64,6	83,0	117		
	EDU 2940 T1SB	1/2"	9,5	4,7	54,5	94,4	122	172	22	64
	EDU 3128 T1SB		11,1		74,5	129	166	235		
	EEU 3165 T1SB	3/4"	12,7	4,7	92,0	165	213	301	27	70
	EFU 3260 T1SB	1"	15,9	6,3	152	253	339	479	34	92
	EFU 3372 T1SB		19,0		215	372	480	679		
120°	ECW 2156 T1SB	3/8"	4,0	3,2	9,0	15,6	20,1	28,4	19	48
	ECW 2230 T1SB		4,8		13,5	23,5	30,3	42,8		
	ECW 2317 T1SB		5,6		18,3	31,7	40,9	57,8		
	ECW 2410 T1SB		6,4		24,0	41,5	53,6	75,8		
	ECW 2640 T1SB		7,9		37,0	64,6	83,0	117		
	EDW 2940 T1SB	1/2"	9,5	4,7	54,5	94,4	122	172	22	64
	EDW 3104 T1SB		10,5		60,0	104	134	190		
	EDW 3128 T1SB		11,1		74,5	129	166	235		
	EEW 3165 T1SB	3/4"	12,7	4,7	92,0	165	213	301	27	70
	EFW 3260 T1SB	1"	15,9	6,3	152	263	339	479	34	92
	EFW 3372 T1SB		19,0		215	372	480	379		

** Capacity at 1 bar = K factor*

Watermist Technology

Watermist nozzles are the newest development in fire fighting from recent years. After having been developed for fire protection systems on ship cabins for crew/passenger their specific advantages have shown to be extremely useful in a growing number of traditional ground applications.
In addition, the small dimensions of the nozzles and the limited quantities of water required have made possible interesting applications in new fields.
The watermist principle is relatively simple, and it is based on the physical law that a fire cannot survive in an atmosphere where the oxygen percentage is lower than 11%.
Based on this, in every closed ambient, it is enough to evaporate a limited quantity of water and therefore introduce in the atmosphere enough steam to lower the oxygen percentage below the above said threshold to extinguish the fire.
It is then clear that a watermist system will not work in any application in any open application.

Therefore a watermist system offers a number of noticeable advantages when compared to a classic sprinkler system

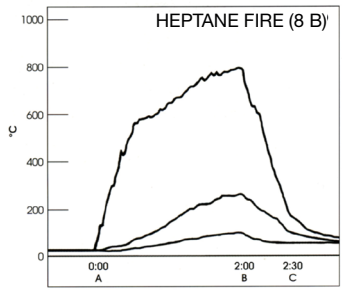
- Obtain a very quick action, since the fire stops in very short times when the Oxygen percentage is reduced.
- Avoid the heating of wall surfaces through convection and irradiation therefore a slow down in fire extension
- Extract from the atmosphere the evaporation heat of water, therefore cooling the ambient. 2
- Require smaller pipe dimensions
- Require smaller waterstocking tanks
- The mist floating in the air, last but not least, will make it easier for any person finding themselves in the ambient to breathe.

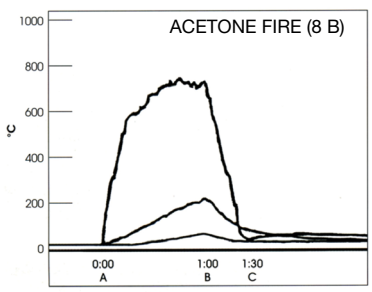
Even considering that watermist systems are not to be used in open spaces, where wind would diminish or eliminate their efficiency, it is possible to list a number of applications which are ideally suited for this technique:

- Cable tunnels in power plants
- Turbine casing in poower plants
- Biblioteques and archives
- Floating floors in computer rooms
- Engine compartment in truck or buses
- Frying pans in industrial kitchens
- Passenger areas in trains or subway

Normally the watermist principle requires a quick evaporation of the droplets injected into the ambient, which means that a watermist nozzles should produce rather small droplets, whose D32 diameter is lower than 150 microns.
D32 is a technical parameter which gives the dimension of that drop whose surface/volume ratio is the same of the average value calculated on all the drops in the sample under examination.
This parameter is typically used when examining an evaporation process.
The most practical way of producing small droplets is by means of a pressure nozzle fed with high pressure water, therefore watermist systems are usually powered by high pressure pumps or high pressure gas bottles.
Both principles allow for the design of compact/portable systems, with limited dimensions and weight.

A recent development also shows that, under given conditions, the watermist concept can be used at relatively low pressures with effective results.





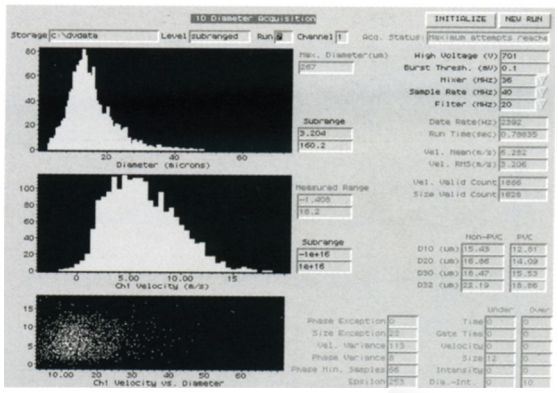
In this page two diagrams showing the temperature graph in a test performed at low pressure (30 bar), some years ago when PNR started to investigate this technology.

Since many years PNR, directly and through one of the companies in the Flowtech group is among the world leaders for the production of systems for evaporative cooling, and in recent years we have developed high technology systems for air cooling and fogging processes for gas turbines.
All the above systems are based on the know-how required to use the evaporation of tiny drops
And produce the high precision nozzles required henceforth.

PNR is active since 15 years on research and application for watermist nozzles, and has designed several nozzles upon request of some important customers, one of which having obtained an IMO approval.
Our experience has allowed to define and produce, in addition to special nozzles, our own standard range of watermist nozzles..
We make available to our customers both standard nozzles and special ones, designed to fill specific needs, manufactured exclusively, under strict confidential agreements, for single customers and branded with their names.

WATERMIST

Watermist nozzles design



Our laboratories are equipped with state of the art instruments, including a laser interferometer which allows examination of drops diameter and report of several data like droplet size spectrum and droplet velocity diagrams.
We can then deliver to our customers nozzles with certified performances.

The first watermist nozzles offered on the market were nothing else than multiple full cone nozzles, a design known since decades in Europe and used primarily for gas and smoke washing.

These nozzles consist in a main body housing a number of cavities, each one of them being the whirling chamber of an hollow cone nozzle and each one provided with an outlet orifice.
By assembling into each cavity a whirl-insert one obtains a multiple nozzle, which produces a full cone spray by interaction of several hollow cone nozzles arranged on a circle onto the main body.

All nozzle engineers know the dimensional relation between orifice and droplet dimension, which says that a smaller nozzle makes a smaller drop, these nozzles where very popular since a small droplet spray could easily be produced with a low pressure water supply, e.g. 3 bar.
The step to obtain a watermist nozzle consisted then into feeding these nozzles with higher pressures, since higher exit velocities from the orifice contributed to even smaller droplets.

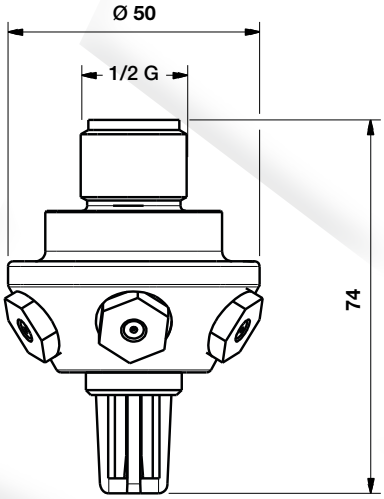
Such nozzles, completed with an inlet filter, and when necessary with a temperature activated glass bulb, are the vast majority of the watermist nozzles today on the market.
Of course some design modifications have been made to adapt the nozzles to the required specifications in term of jet penetration, throw distance and volume filling.

Research on new nozzle design

In addition to produce watermist nozzles for customers using proprietary design and ou standard range of watermist nozzles we continuously run research projects to investigate new designs for more efficient and convenient nozzles.

The project actually under evaluation is a new cocept where vey small orifices are distributed over an hemispherical surface, onto which any layout of orifices is possible so as to obtain directional sprays in any possible desired direction.
To address this problem a new nozzle has been developed, based onto a well know principle, that is the one based on a straight jet at high speed, which is fractionated by air drag and resistance.
It has been possible to produce such a straight jet with a very small diameter, so that the jet break up happens at a very small distance from the nozzle.
Typical values for this process are jet diameter 0.13 mm and break up length 1.5 meters.
The microscope picture shows one of these tiny orifices,

CJ TYPE NOZZLES



CJ type nozzles feature a classic multiple orifice construction, with a series of nozzles arranged on a circle over a single body. This design allows for a wide spray angle range, from about 180° to lower values. The single micro nozzles are fitted with individual inlet filter to protect the small inside passages from the danger of clogging, and with an optional temperature sensitive bulb to activate the spray when the room temperature exceeds the design value.

Materials

All metal components		B1 - AISI 303 Stainless steel (standard type) B31 - AISI 316L Stainless steel T8 - Nickel plated brass
Actuator seal	---	Buna

Spray angle	Code	Capacity Lpm at pressure (bar) *100*
180°	⋆ CJZ A069 B31PG	6,95
	CJZ A100 B31PG	10

** Tested according to UNICEN TS 14972 norms for OH1 fires*

TESTED ACCORDING TO CEN 14972

Code creating procedure to order product. Example:

Series	Spray angle	Construction	Flow rate	Material	Positioning	Connection
C J	Z	0	1 2 3	M M	L	B

Spray angle: Z = 180° (β = 120°)

Construction

0 →	without central nozzle	without thermo bulb	
1 →	with central nozzle	without thermo bulb	
A →	without central nozzle	with thermo bulb @ TR = 57°C (135°F)	(bulb JOB F3-XS Orange)
B →	without central nozzle	with thermo bulb @ TR = 68°C (155°F)	(bulb JOB F3-XS Red)
C →	without central nozzle	with thermo bulb @ TR = 79°C (175°F)	(bulb JOB F3-XS Yellow)
D →	without central nozzle	with thermo bulb @ TR = 93°C (200°F)	(bulb JOB F3-XS Green)
E →	without central nozzle	with thermo bulb @ TR = 141°C (286°F)	(bulb JOB F3-XS Blu)
F →	without central nozzle	with thermo bulb @ TR = 182°C (360°F)	(bulb JOB F3-XS Mauve)
G →	without central nozzle	with thermo bulb @ TR = 260°C (500°F)	(bulb JOB F3-XS Black)

Flow rate :
It indicates flow rate in lpm tenths, reference pressure 100 bar

Nozzle positioning *
L →opposite (2) **T** →triangle (3) **X** →cross (4) **P** →pentagonal scheme (5) **S** →star scheme (6)
**Note: Only for construction 1, central nozzle must be considered (+1)*

Connection
B → BSPT male taper thread
G → BSPP male parallel thread
N → NPT male taper thread

Note: Filters are integrated in each nozzle spray