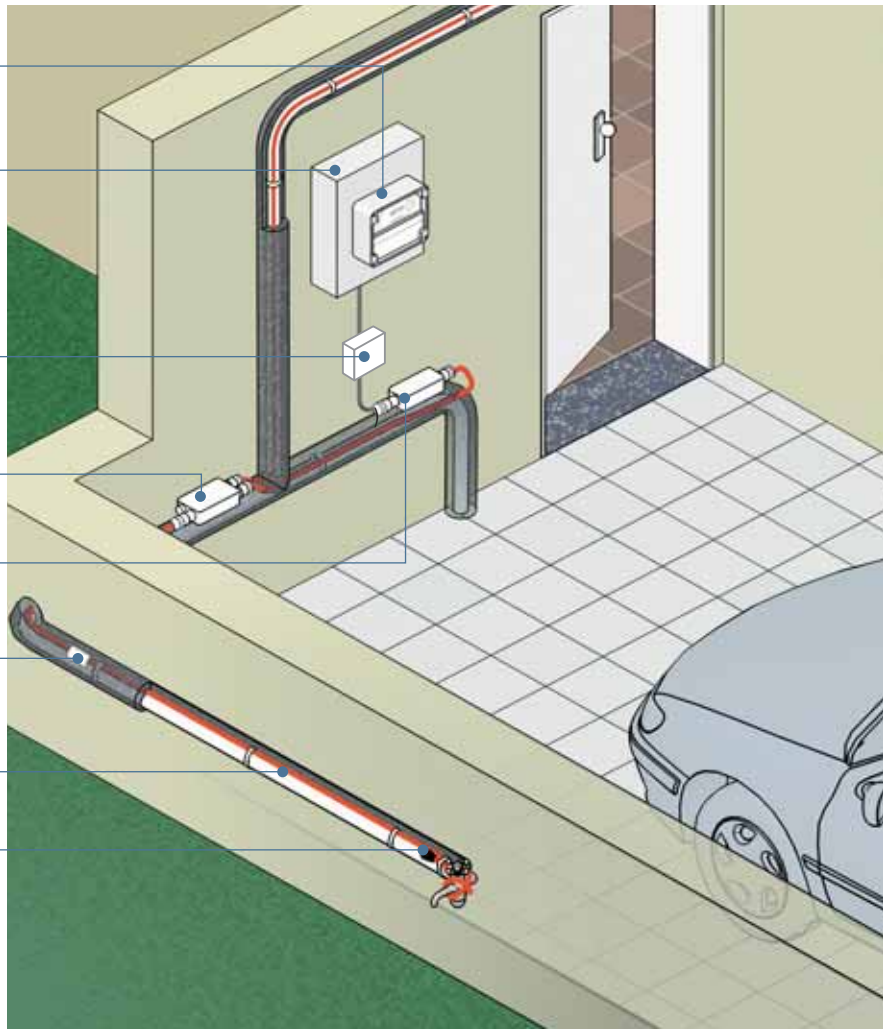
Frost protection for pipes

Frozen pipes can be a costly problem. When pipes are exposed to sub-zero temperatures they can burst, leading to considerable damage and disruption. The Raychem frost protection system for pipes provides an efficient solution. The self-regulating heating cable, combined with an adequate insulation, prevents water pipes, fire mains, sprinkler systems and fuel oil lines from freezing.

Easy to install
The heating cable is simply fixed onto the pipe – under the thermal insulation. Connections are quickly made with the fast RayClic connectors.

Durable and reliable
The cable's large copper conductors make it a reliable solution and its specially formulated outer jacket protects it from severe environmental conditions.

Low power consumption
The smart RAYSTAT -ECO control unit calculates a duty-cycle proportional to the expected minimum temperature. Where a simple ambient thermostat would energize the heating cable for 100%, the "smart" controller would energize for a fraction of the time, resulting in significant extra savings.



Design guide, control units and accessories

1. Heating cable selection

Application

Frost protection for pipework at max. 65°C operating temperature

FS-A-2X	10 W/m at 5°C
FS-B-2X	26 W/m at 5°C

Frost protection for pipework at max. 95°C operating temperature and temperature maintenance for metal waste pipes with fatty waste water

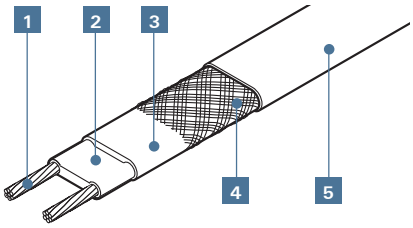
FS-C-2X	31 W/m at 5°C
	22 W/m at 40°C

Frost Protection for pipework to maximum 90°C operating temperature. For long circuit applications and central heating pipework.

FS-C10-2X	10 W/m at 5°C

TraceCalc.Net Construction is a software tool for product selection based on actual project data. Visit <http://www.tycothermal.com/uk/english/heat_tracing/software/industrial_design/default.aspx> for more information.

2. Composition of the FS-A/B/C/C10-2X heating cable



1. Copper conductor (1.2 mm²)
2. Self-regulating heating element
3. Modified polyolefin insulation (FS-C-2X: Fluoropolymer)
4. Protective tinned copper braid
5. Modified polyolefin protective jacket

Note: FS-C10-2X comprises copper conductors (1.4 mm²)

3. Insulation selection

Frost protection down to –20°C.

Insulation thicknesses	Pipe diameter mm / Inches	15 1/2″	22 3/4″	28 1″	35 5/4″	42 11/2″	54 2″	67 21/2″	76 3″	108 4″	125 5″	150 6″	200 8″
10 mm		FS-**A**-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X					
15 mm		FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X			
20 mm		FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X		
25 mm		FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	
30 mm		FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X
40 mm		FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X
50 mm		FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**A**-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X

Frost protection cables FS-A-2X, FS-B-2X and FS-C10-2X are suitable for any pipe material (copper, threaded pipes, stainless steel pipes, plastic pipes and composite metal pipes without restriction).
For plastic pipes, please use aluminium adhesive tape ATE-180. The frost protection cable should be covered along its entire length. Heat insulation λ = 0.035 W/(m.K) or better.

Important note: frost protection heating cables with fluorpolymer protective jacket (e.g. type BTV2-CT) must be used for solvent-containing, mixed and/or bitumen-coated heat insulation.

40°C temperature maintenance on pipelines for fatty waste water

Insulation thicknesses	Pipe diameter (mm) 42 11/2″	54 2″	67 21/2″	76 3″	108 4″	125 5″	150 6″	200 8″
30 mm	FS-**C**-2X							
40 mm	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X					
50 mm	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X				
60 mm	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X

Min. ambient temperature –10°C. Heat insulation λ = 0.035 W/(m.K) or better.

Frost protection for pipes

Cable type FS-C-2X should only be used in conjunction with pipework with a minimum continuous temperature resistance of 90°C. A line-sensing control thermostat (type AT-TS-14, RAYSTAT-CONTROL-10 or RAYSTAT-CONTROL-11-DIN) must be used on plastic pipework (setting approx. 40°C).

4. Cable length

The heating cable should be installed in a straight line on the pipework.
Cable loops instead of T-connections can be made on short dead legs.
(up to approx. 3 m)

+ approx. 0.3 m per connection
+ approx. 1.0 m per T-connection
+ approx. 1.2 m per 4-way connection
Additional cable required for increased heat sinks at valves from 2" and for uninsulated pipe supports (approx. 1 m)

= required heating cable length

5. Electrical protection

- The total length of heating cable determines the number and size of the fuses
- Residual current device (rcd): 30 mA required, max. 500 m heating cable per rcd
- Installation according to local regulations
- The power connections must be carried out by an approved electrical installer
- Use C type circuit-breakers

Max. length of the heating circuit is based on a minimum switch-on temperature of 0°C, 230 VAC.

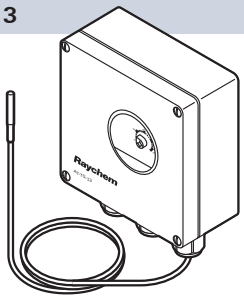
	FS-A-2X	FS-B-2X	FS-C-2X	FS-C10-2X
4 A	45 m	25 m	20 m	45 m
6 A	70 m	35 m	30 m	70 m
10 A	110 m	65 m	55 m	110 m
13 A	130 m	85 m	70 m	130 m
16 A	150 m	105 m	90 m	150 m
20 A	–	–	–	180 m

6. Testing of the installation

See page 55

7. Thermostats

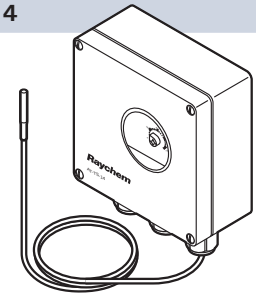
AT-TS-13



Thermostat
- Adjustable temperature range: –5°C to +15°C
- Line-sensing control thermostat or ambient thermostat
- Max. switching current 16 A, 250 VAC

Technical data: see page 26

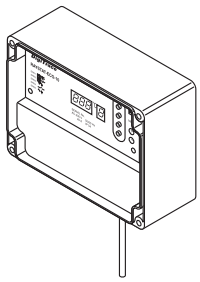
AT-TS-14



Thermostat
- Adjustable temperature range: 0°C to 120°C
- Temperature maintenance on pipelines for fatty waste water
- Line-sensing control thermostat
- Max. switching current 16 A, 250 VAC

Technical data: see page 26

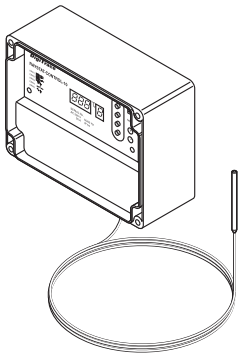
RAYSTAT-ECO-10



Ambient temperature thermostat
- Adjustable temperature range: 0°C to 30°C
- Max. switching current 25 A, 250 VAC
- PASC (Proportional Ambient Sensing Control) for energy saving
- Alarm relay: 2 A voltfree with indication of sensor errors, voltage errors and low or high temperature alarm
- Display for visual indication of parameters

Technical data: see page 26

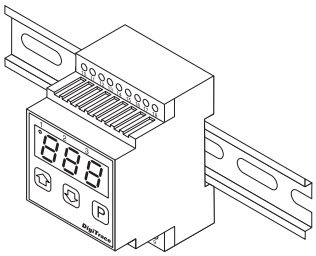
RAYSTAT-CONTROL-10



Line-sensing thermostat
- Adjustable temperature range: 0°C to 150°C
- Max. switching current 25 A, 250 VAC
- Alarm relay: 2 A voltfree with indication of sensor errors, voltage errors and low or high temperature alarm
- Display for visual indication of parameters

Technical data: see page 30

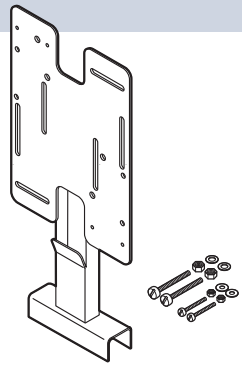
RAYSTAT-CONTROL-11-DIN



Line sensing thermostat with digital display for DIN rail mounting applications.
- Set temperature range: 0 - 65°C.
- Digital display of maintain temperature and alarm information. 16A switching.
- Low temperature alarm function
- DIN rail / Panel mountable control.
- Sensor type: PT100.

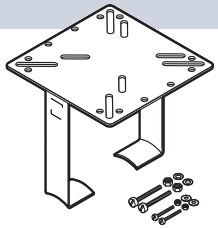
Technical data: see page 32.

SB-100



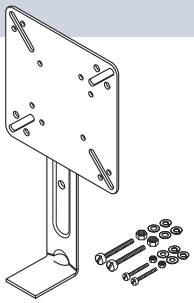
Stainless steel support bracket
- Specially constructed to provide heating cable protection between pipe and junction box via a tubular leg.
- For use with AT-TS-13, AT-TS-14, JB16-02 and RAYSTAT-CONTROL-10

SB-101



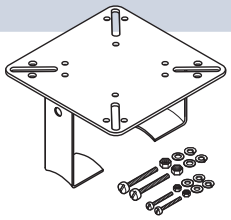
Dual-leg support bracket, stainless steel
- Height leg: 160 mm
- For use with AT-TS-13, AT-TS-14, JB16-02 and RAYSTAT-CONTROL-10

SB-110



Support bracket, stainless steel
- Height leg: 100 mm
- For use with AT-TS-13, AT-TS-14, and JB16-02

SB-111



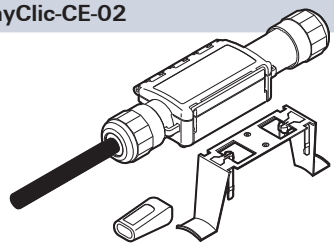
Support bracket, stainless steel
- Height leg: 100 mm
- For use with AT-TS-13, AT-TS-14, and JB16-02

8. Accessories for FS-A-2X and FS-B-2X cables

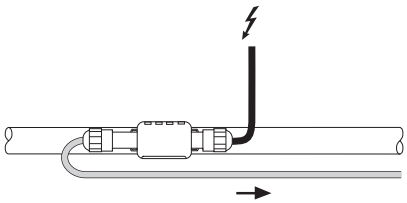
	FS-A-2X FS-B-2X
Power connection	RayClic-CE-02
Splice	RayClic-S-02
Powered splice	RayClic-PS-02
T-connection	RayClic-T-02
Powered T-connection	RayClic-PT-02
Four way connection	RayClic-X-02

Note: A splice can also be made using an S-06.

RayClic-CE-02

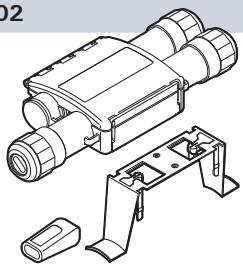


Power connection
- With 1.5 m power cable
- End seal and support bracket
- IP 68
- External dimension: L = 240 mm
  W = 64 mm
  H = 47 mm

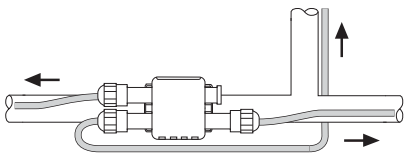


Note: RayClic components are not compatible with FS-C-2X /FS-C10-2X

RayClic-T-02



T-connection
- Connection for 3 cables
- End seal and support bracket
- IP 68
- External dimension: L = 270 mm
  W = 105 mm
  H = 42 mm



Note: RayClic components are not compatible with FS-C-2X /FS-C10-2X