Installation Guide

Heating cables

for **In-Slab** and **In-Screed** Applications

BROCDEV135.1

Intelligent Electric Floor Heating™

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1 Introduction

DEVI® is Europe's leading brand of electrical cable heating systems with over 70 years of experience. DEVI® became a part of the **Danfoss** Group from 1 January 2003. Danfoss is one of the world's leading companies within heating, cooling and air-conditioning with more than 23,000 employees serving customers in over 100 countries. DEVI® is Europe's largest supplier of electrical floor heating; the only global company in the industry that develops, produces and markets complete systems containing both heating cables and thermostats.

The phrase "**heating cable**" refers to pre-made lengths of electric heating cables, including heating cables supplied on a mat or mesh.

DEVIflex™ heating cables are used in a wide variety of situations. Applications include direct acting, storage and background floor heating systems. Other uses include ice and snow melting as well as agricultural and industrial applications. They can be suitable for use in concrete slabs, sand/cement screeds, mortar beds, levelling beds and specialist applications. Floor heating cable applications are often covered with carpet, tiles, vinyl, timber or other floor finishes.

DEVImat™ heating cables are attached to a fibreglass mat and are used in thin floors, such as directly under tiles in a glue bed. They provide a fast heat up and economical operation, particularly with thermal insulation under the heating.

This Installation Guide presents DEVI® recommendations for design and installation of in-slab and in-screed under floor heating cable systems for indoor applications. It provides guidance for heating cable positioning, electrical data and system configurations.

For additional information, please refer to

- **Data sheets** - for technical information on the selected heating cable.
- **Conduit Installation Guide** - provides more detail.
- **Timber floors Installation Guide** - provides details on various installation options with timber floors.
- **Thin floor Devimat Installation Guide** – for thin floor and under tile applications.
- **Thermostat Installation and Programming Guide** - for your selected thermostat.
- **Contactor wiring diagram** - for the selected thermostat, required for large area heating zones.
- DEVI® **Application Manual** for Indoor Cable Floor Heating - for more detailed information.
- DEVI® **Application Manuals** for other applications - e.g. Pipe tracing, Frost protection (Freezers), Ice & Snow (ground incl. roads), Sports grounds, Agriculture.

Brochures, Specification sheets, and Installation & Programming guides are available on the Devex web site http://www.devexsystems.com.au/electric-and-hydronic-floor-heating-documentation.html or directly from Devex Systems.

You are welcome to phone us so that we can assist you with your floor heating design, installation, commissioning – 1800 636 091. We can provide investigation and repair service, but this is only in Australia where DEVI heating cables have been installed.

2 Cable and Application Overview

This Installation Guide is for in-slab and in-screed installations using the following heating cable types

HEATING CABLE TYPE		*MAIN APPLICATION*
DEVIflex™	DTCE-30	In-slab floor heating, and snow/ice melting (single cold tail)
DEVIflex™	18T	In-screed floor heating for most floor surfaces, except timber (single cold tail)
DEVIflex™	10T	In-screed, timber floors, pipe trace heating (single cold tail)
DEVIbasic™	DSIG-20	In-screed (two cold tails) (refer to its replacement by DEVIflex™ 18T)

		APPLICATIONS								
HEATING CABLE TYPE		Heating directly under tiles (≤ 15mm)	Heating in floors with thin levelling bed (≤ 15mm)	Heating under wooden floors	In-slab (storage) heating in concrete floors	In-screed heating on concrete floors	In-screed heating under timber floors	Freezer (frost heave protection)	Frost protection	Ice and snow melting
DTCE-30	in-slab	x	x	✓	✓	x	x	✓	x	✓
DEVIflex™ 18T	in-screed	x	x	x	✓*	✓	x	✓	✓	✓
DEVIflex™ 10T	in-screed	x	x	✓	x	x	✓	✓	✓	✓
DSIG-20	in-screed	x	x	x	✓*	✓	x	✓	✓	✓

** DEVIflex™ 18T is not recommended In-Slab (please contact us).*
DSIG-20 cables are replaced by the DEVIflex™ 18T.

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Specification sheets are available for each of these cables.

We have heating cables that are suitable for all these applications and for other under floor heating and specialist purposes. Please contact us regarding your specific application and other heating cable types that are available.

TWIN CABLES – with a SINGLE COLD TAIL and SINGLE CABLES – with TWO COLD TAILS

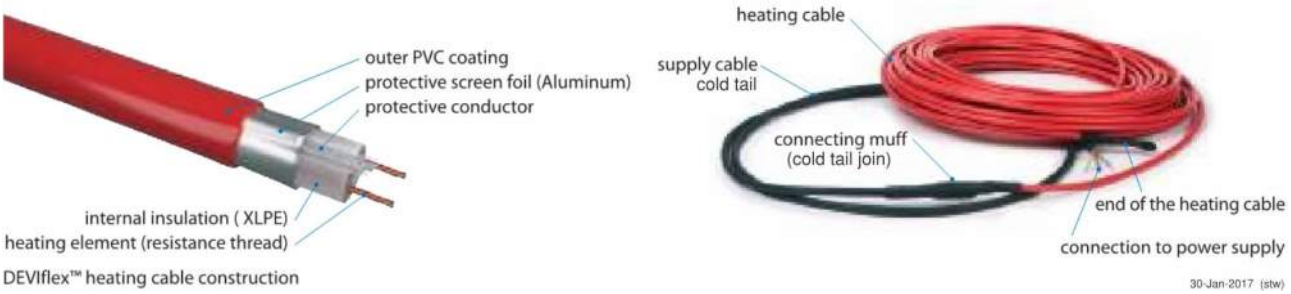
The number at the end of the cable name refers to its specific output for a 1 m length of cable (in W/m at 230V), whereas the number at the end of the cable mat cable name is the specific output for a square meter of the mat (in W/m² at 230V).

The letter "T" in the cable name refers to a twin conductor cable (Twin), which has only one two-core cold tail. The letter "S" in the cable name refers to a single conductor cable (Single), which has a two one-core cold tails. See examples below.

	TWIN CABLES ONE COLD TAIL		SINGLE CABLES TWO COLD TAILS
EXAMPLES			
Heating Cables:	DEVIflex **18T** (18 W/m Twin)	and	DSIG-**20** (20 W/m Single)
Heating Cable mats:	DTIF-**100** (100 W/m² Twin)	and	DSVF-**150** (150W/m Single)

A twin core heating cable (with a single cold tail) is easier to install than a single core heating cable (which has two cold tails). This is because with two cold tails the end of the heating cable must be brought back to the start of the cable run to then both go to the thermostat location.

EXAMPLE Deviflex™ 18T and 10T heating cables (twin cables with a single cold tail)



3 Safety Instructions

Heating cables must always be installed in accordance with local building regulations and the electrical AS/NZS 3000 Wiring Rules, as well as the guidelines in this Installation Guide.

Important safety requirements

- De-energize all related power circuits before installation or servicing the heating system.
- The outer screen around each heating cable must be earthed (at both ends for two cold tail heating cables) in accordance with local electricity regulations.
- Supply must be through a Residual Current Device (RCD) that will trip with more than 30 mA earth leakage.
- Heating cables should be connected via a switch providing all pole disconnection.
- The heating cable must be equipped with a correctly sized circuit breaker (or fuse) according to local regulations.
- The maximum heat density (W/m length) of the heating cable itself must not be exceeded for the application.
- The switchboard/distribution board must clearly identify the floor heating system.

4 Cable Requirements

- It is not recommended to install heating cables where the temperature of the cables can be lower than -5°C.
- The maximum permitted operating temperature of the cables is 60/65°C (refer to the cable specifications).
- Heating cable bending diameter must be at least 6 times the cable diameter (7.5 times for DTCE-30 heating cables).

- The heating cables are designed and rated for a nominal 230V supply. They will therefore operate at a higher power and current if your installation supply voltage is higher (by Ohms Law). The single phase installation voltage supply must comply with AS/NZS 60038, being 230V -2% to +10% (222V to 253V). Power cables, thermostats and protective/control equipment must be rated to allow for this tolerance. E.g a single 2.3kW heating cable run at 230V consumes 10A, but if the supply voltage is 250V, then it will consume almost 11A and operate at 2.7kW.

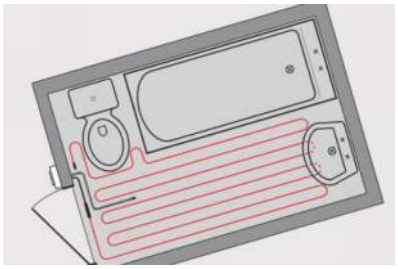
Refer to separate specification Data Sheets available for each of these cables for further details.

5 Important

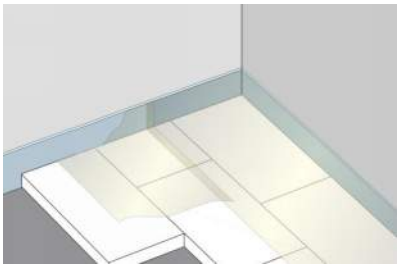
- These instructions must be read prior to commencing installation.
- Failure to comply with the Installation Guide will void the warranty.
- Heating cable installation must be carried out under the supervision of a licensed electrician.
- A label/marking is to be fixed to the electrical switchboard listing the rooms with heating cables.
- 'As Installed' drawings and/or photographs of each cable installation should show the installed heating cable(s) and sensor location(s) and should be kept on file with a copy provided to the customer.
- Heating cable must not be cut or shortened. However, cold tails may be cut or extended.
- Cold tail termination(s) to the heating cables must be embedded in the floor and not subjected to strain at any time.
- Fixing shall ensure that all heating cable lengths are securely fastened.
- Correct spacing must be calculated for each type of cable to suit the application (refer *Heating Cable Spacing* table, page 10).
- As a minimum requirement, all DEVIheat™ floor-heating installations are to be controlled using a DEVIreg™ floor sensing thermostat.
- DEVIfex™ DTCE-30 cable must be installed in a concrete slab except when controlled to only operate in snow/ice conditions (refer *Cover over Heating Cables* table, page 9)
- Thermostat floor sensor cables each need to be in their separate conduit such that they can be easily accessed and replaced at any time in the future.
- Ensure that the client is aware that coverings or objects with a high thermal resistance are NOT to be placed directly on the floor. Also advise them that all large items need to be adequately ventilated underneath.

IN-SCREED INSTALLER SUMMARY Heating Cable Installation Steps

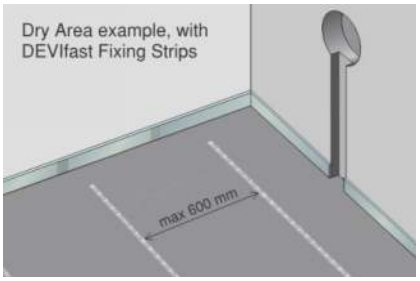
1. Cable heating system
- Heating cable
- Thermostat (with floor sensor)
- Sensor flexible conduit (10mm)
- Mesh and ties (or fixing strip)



2. Draw a plan showing the actual heated area, heating cable, cold tail location, floor sensor position, thermostat and connection box (if any).

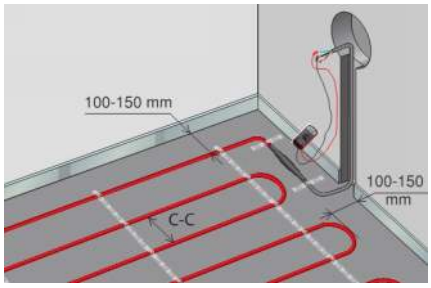


3. Install appropriate thermal insulation on the existing floor.

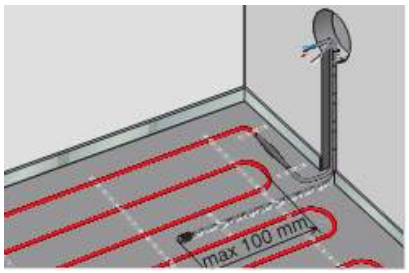


4. Lay wire mesh (if wet area) for tying the heating cables in position, or fit DEVIfast™ fixing strip (if dry area). Cable tie points are spaced max 600 mm apart.

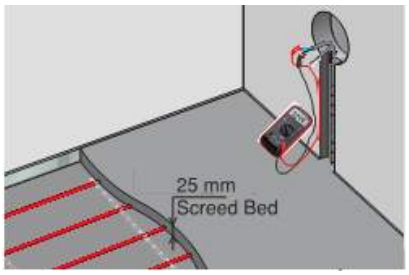
Wet Area on mesh on a membrane



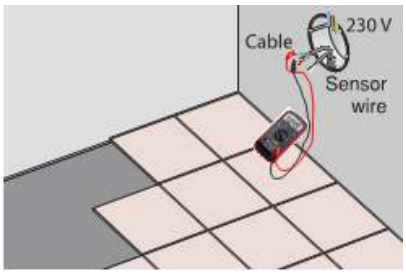
5. Check the heating cable resistance and its insulation resistance values. Install the heating cable spaced from walls 100 to 150mm. Ensure that the cable spacing requirements are adhered to.



6. Install individual conduits for the power cables and the floor sensor (see details). Check the resistance of the sensor before installing it.
(15k ohms when at 25°C)



7. Check the cable resistance and the insulation resistance values again before pouring concrete or laying the screed bed.



8. Check the cable resistance and the insulation resistance values again when installing the thermostat (they are usually installed a later).

Read the installation guides supplied with the heating cables and thermostats for any specific requirements relating to your installation.

Heating cables must be securely attached to the floor before pouring concrete/screeds so that the cables cannot lift or vary their spacing. Air pockets around the cables must be prevented.

Heating cables must never touch or cross over each other or failure is likely.

Failure to comply with the Installation Guide will void the warranty.

Please contact Devex Systems (phone 1800 636 091) if unsure of any aspect of the installation.

Please REFER TO THE INSTALLATION DETAILS IN THESE INSTRUCTIONS

6 Installation Instructions

6.1 GENERAL

1. **Heating cable connections** are considered to be electrical wiring and as such must be carried out by a licensed electrical tradesperson in accordance with AS/NZS 3000 Wiring Rules, and any other relevant regulations.

2. Check to ensure that the **heating cable selected** is suitable for the area and type of heating required. Verify with the builder the floor heights, floor construction method and floor surfaces. Refer to the heating cable specification sheets to verify suitability.

3. Determine the **correct spacing** for the cable runs (see *Heating Cable Spacing* table, page 10).

4. Care must be taken to ensure that the heating **cable operating temperature** does not exceed 60°C (65°C for the DEVIflex™ 18T and DEVIflex™ 10T). The heating cable is to be embedded in thermally conductive flooring material without air pockets or voids, and must be kept clear of any thermal insulation.

5. **Distance to a screed surface** must be at least 20 mm, and to a **slab surface** 25 mm. Alternative products and design can be offered if these requirements cannot be met. (refer *Cover over Heating Cables* table, page 9)

6. **Thermal insulation** is recommended under heating cables to reduce the heat loss downwards away from where the heating is needed. Good thermal insulation is eco-friendly because it increases efficiency. It improves the heating effectiveness, reduces energy consumption, and results in a faster heat up time. Heat losses can mean that the floor heating is less effective and the desired comfort level may not be achievable.

7. An as **installed quality check** is essential, even though the heating cables have been quality checked prior to leaving the factory. It is important to check that the resistance values (ohms) are as specified on the cable label (within -5% to +10%) and that this size cable is what is required for the job. A 500V insulation resistance tester (e.g. Megger) should be used to check the cable insulation and a continuity monitor should be connected to the heating cable during the construction phase. A continuity tester can be supplied with the cable(s) and may be used to conveniently check cable continuity during the installation and concrete pour phases, but this does not replace the need to use a 500V Insulation Tester to verify the heating cable integrity. Insulation resistance and cable resistance values should be checked immediately prior to concreting or placing of the concrete/screed over the cables.

8. Adequate steps must be taken to **avoid mechanical damage** to heating cables during cable installation and building construction. It is also important to avoid mechanical strain, twisting, tangles, kinks, tight bends, pinching, crushing, etc. Care must be taken to avoid straining the connection joint or terminations by pulling or stretching the cables.

9. If only the **outer sheath is punctured** or cut causing a loss of insulation resistance between the cable screen and the surrounding concrete/screed, that the damaged area is to be cut and repaired. The repair location should also be clearly marked on the installation layout drawing/photo. If in any doubt, then the damaged area must be repaired using the appropriate repair kit available from Devex Systems.

6.2 COVER over HEATING CABLES

INSTALLATION TYPE	CABLE DEPTH			NOTES
	Target Depth	Maximum Depth	Minimum Depth	
	mm	mm	mm	
In-Slab (DTCE-30)	**40**	75	25	Must not vary more than 20mm
In-Screed (DEVIflex™ 18T, 10T, DSIG)	**20**	40	15*	* if covered by tiles
Levelling bed (DEVIflex™ 10T)	**12#**	15	12#	# needed to store/distribute heat.
Thermal insulation is recommended to be under all floor heating areas.				
Thicker screed or levelling bed should be avoided				
It is much better to lay insulation sheet under the heating cables rather than have thick screeds.				

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6.3 CONDUITS installed by the Site Electrician

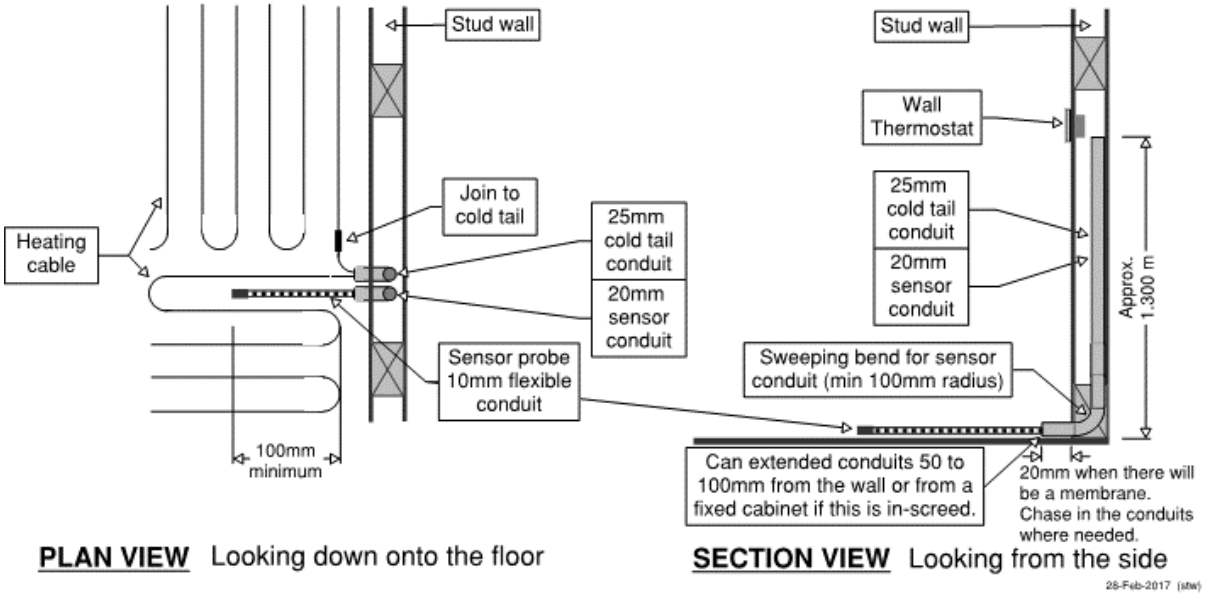
Conduits for the power cabling and for the sensor probe must be installed before beginning your DEVI® under floor heating system installation.

1. Each heating cable requires a 25mm empty conduit for larger areas (though 20 mm is the minimum for small areas). This conduit is for the power cable cold tails, and it is to run from the top of the finished concrete floor level to the switch or thermostat position. A draw wire is essential if any conduit fittings or couplings are used.

2. The Sensor Probe requires a 16 or 20mm conduit for each floor sensing thermostat with no more than two wide radius bends from the thermostat/connection point. A 10 mm OD flexible conduit (with a minimum 7 mm ID) is recommended to then be run inside each conduit and sealed at the end with electrician's tape so as to prevent ingress of water/ cement/ glue. This 10 mm conduit is readily available from Devex Systems. Sensor probes must be installed in a conduit so they can be replaced at any time in the future.

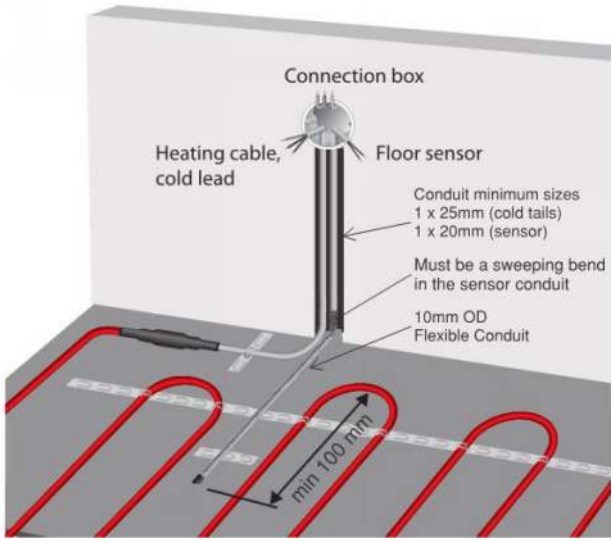
RECOMMENDED CONDUIT INSTALLATION METHOD

This EXAMPLE shows a typical installation for a twin heating cable (with one cold tail).
Conduits are shown for an in-screed installation with a waterproof membrane.



For further details, please refer to the "*Conduit Installation Guide*".

EXAMPLE of Conduit and Sensor installation method



6.4 HEATING CABLE SELECTION and SPACING

The cable type depends on the floor construction method (refer *Cable and Application Overview* section, page 4). Only select heating cables that are appropriate for the floor construction.

- **In-slab** – DTCE-30 heating cable.
- **In-screed** – Deviflex 18T and DSIG-20; or Deviflex 10T for under timber floors tiles (refer to the separate Installation Guide for Timber Floors).
- **In a Thin Floor**, or in a glue bed directly under the tiles (refer to the separate Installation Guide for Devimat cables).

The following table shows the design watts and **heating cable spacing** requirements.
In-slab heating cables are tied to the reinforcing mesh. In-screed cables can be attached to DEVIflex™ Fixing Strip that permits spacing at 25 mm increments to achieve the target spacing recommendation.

HEATING CABLE TYPE	HEATING CABLE SPACING C-C					
	Design Watts	Target Spacing	Maximum Spacing	Spacing from Walls and Fixtures	Minimum Spacing permitted	NOTES
	W/m²	mm	mm	mm	mm	
DTCE-30 in-slab in a DRY area application	150	**200**	200	200	100	
DTCE-30 in-slab in a WET area application	200	**130**	130	100	100	
DEVIflex™ 18T in-screed DRY Not timber	200	**100**	100	100	50	
DEVIflex™ 18T in-screed WET Not timber	290	**75**	78	50	50	
DEVIflex™ 10T in-screed	140	**70**	75	100	50	
DEVIflex™ 10T in-screed under Timber	100	**100**	100	100	50	Floor limiting thermostat required.
DEVIflex™ 10T Devicell Floating Timber	100	**100**	100	100	100	Floor limiting thermostat required.

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Cable spacing C-C (Centre to Centre distance in mm) is the distance from the centre of one heating cable to centre of the next heating cable laid in the floor. No heating cables are to be closer than the minimum spacing and spacing needs to be even so that the floor heating is even.

Cable length required

$$\text{Cable Length (m)} = \frac{\text{Area to be heated (m}^2\text{) x 1000}}{\text{C-C (cable spacing in mm)}}$$

Spacing for a supplied cable (spacing to be within the above table guidelines)

$$\text{C-C (mm)} = \frac{\text{Area to be heated (m²) x 1000}}{\text{Cable length (m)}}$$

Area loading (design)

$$\text{Area Loading (W)} = \frac{\text{Heating Cable (W/m) x 1000} \quad \text{x} \quad \text{Area (m²)}}{\text{C-C (mm)}}$$

Devex Systems provide an obligation free **design and quoting service** for supply and install as well as supply only of heating cables and any accessories that may be needed. This saves having to calculate the requirements and provides peace of mind that the correct cables are provided, as long as the drawings and measurements supplied to us are correct and accurate.

Estimation of heated floor area.
The Installation area of a heating cable/mat must be calculated based on the total area (m²) of the room excluding the area under fixed objects (such as bath, toilet, shower, vanity, cabinet, cupboards, etc.). Special customer preferences should also be taken into account. When determining the cable size needed we will design to be clear of any floor level changes, fixtures, drains (including strip drains) and walls (usually with 100 to 150 mm separation) to avoid potential damage to the heating system.

The heating cable or mat is embedded into the floor, so it is advised to exclude from the heated area any furniture or other items that cannot be moved during the life of the premises: e.g. joinery that is fixed in place, such as built-in wardrobes, fixed cabinets, non-movable beds, etc.

Choice of Heating Cable
The heating cable selected must be appropriate for the installation and have the correct length to meet the design spacing requirements.

A helpful check is to ensure that the heating power density is suitable for the area. We recommend the whole of the exposed floor is heated at a minimum 100 W/m² though some applications can be as high as 290W/m² (see "*Heating Cable Type*" table, above). The application defines the cable type, and the recommended spacing for that application determines the heating requirement.

Heating Power Density (watts per square metre)

$$\text{Power Density (W/m²)} = \frac{\text{Heating Cable (W)}}{\text{Area (m²)}}$$

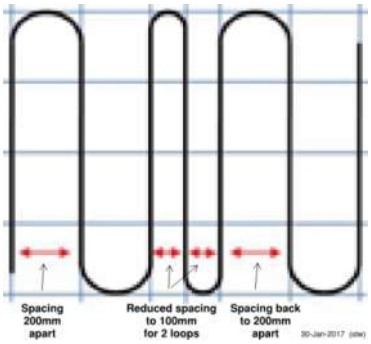
For in-slab heating DEVI® recommends the twin conductor DTCE-30 heating cables. For in-screed heating DEVI® recommends the twin conductor DEVIflex™ 18T (or DEVIflex™ 10T for under timber or sensitive floors).

If the installation area is large then more than one heating cable may be required for the heated area. The cables would be controlled by the same thermostat but it is likely that a contactor would be needed so that the thermostat is not overloaded (thermostat maximum load is 12A).

6.5 IN-SLAB CABLING

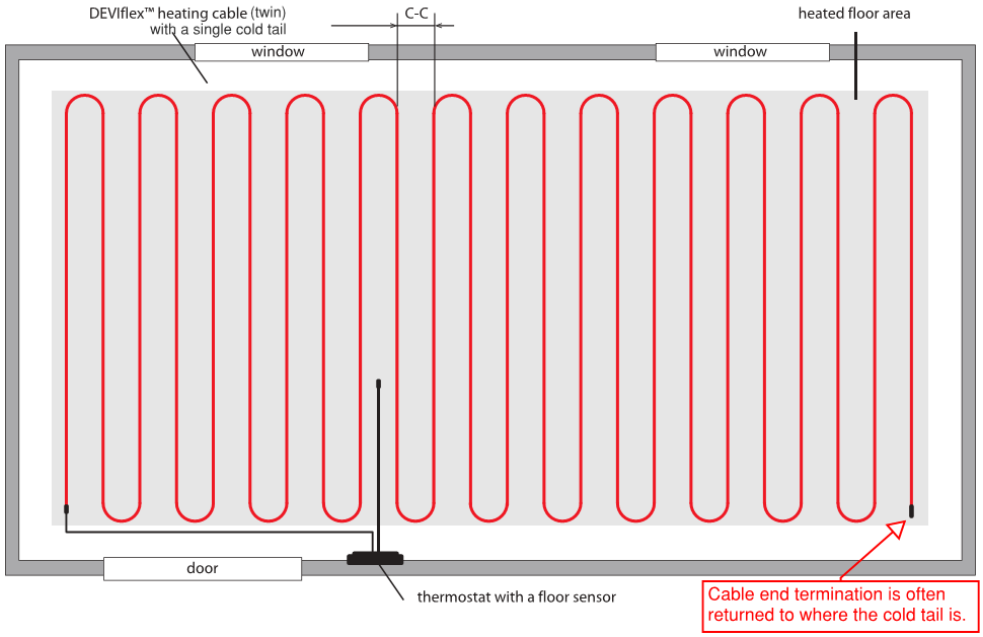
DTCE-30 cable is designed for in-slab under floor heating and is only used in-slab for floor heating.

1. The heating cables are designed to be installed onto L72/ L82/ L92/ SL102 (F72-F92) steel reinforcing mesh, to allow for nominal 200mm spacing of the heating cable(s). They should be attached to the top structural reinforcement steel for the slab. If this is not possible, use a separate layer of light gauge reinforcing mesh. The cables require a minimum concrete cover of 25 with a maximum cover of 75mm of concrete. The variation in cable height in the slab should not exceed 20mm otherwise variations in the floor heating may be experienced by the occupants. The cables are attached to the reinforcing steel using clips or tie wires that do not damage the cable sheath. The spacing of these cable fixings should not exceed 600 mm and must properly support the cable.



2. Occasionally it may be necessary to place a length of cable onto an area of mesh where the C-C fixing at 200 mm spacing is too wide to use up the calculated cable length. In such cases no more than one double run (2 x 100mm) may be laid and then revert back to the full 200 mm spacing. Closer spacing is acceptable only where the cable loading, in W/m², is to be higher, such as for bathrooms. (refer table in the *Heating Cable Selection*, section, page 10).

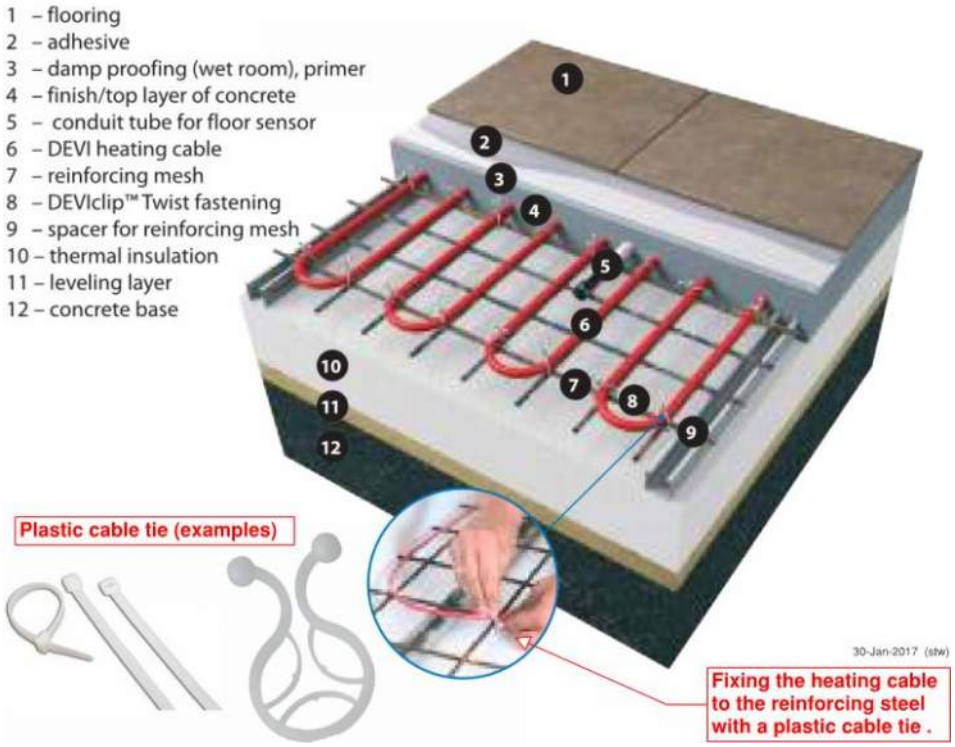
EXAMPLE of the in-slab installation



3. Where cables need to be run between the reinforcing mesh grid spacing available, light gauge steel rods, typically 6 mm in diameter, with sufficient rigidity to support the weight of a person, should be fastened alongside the cable runs to enable the fixing and the support of the cables.

Note:
A sketch or photograph record of the installation must show the approximate location of the heating cable(s), the sensor conduit(s), the active and the neutral terminations. A copy should remain with the installation for the benefit of future owners/occupiers. This can be used to locate the heating cables for any future work or for later modifications to floor/layout construction.

EXAMPLE of the in-slab installation method (in a Topping Slab)

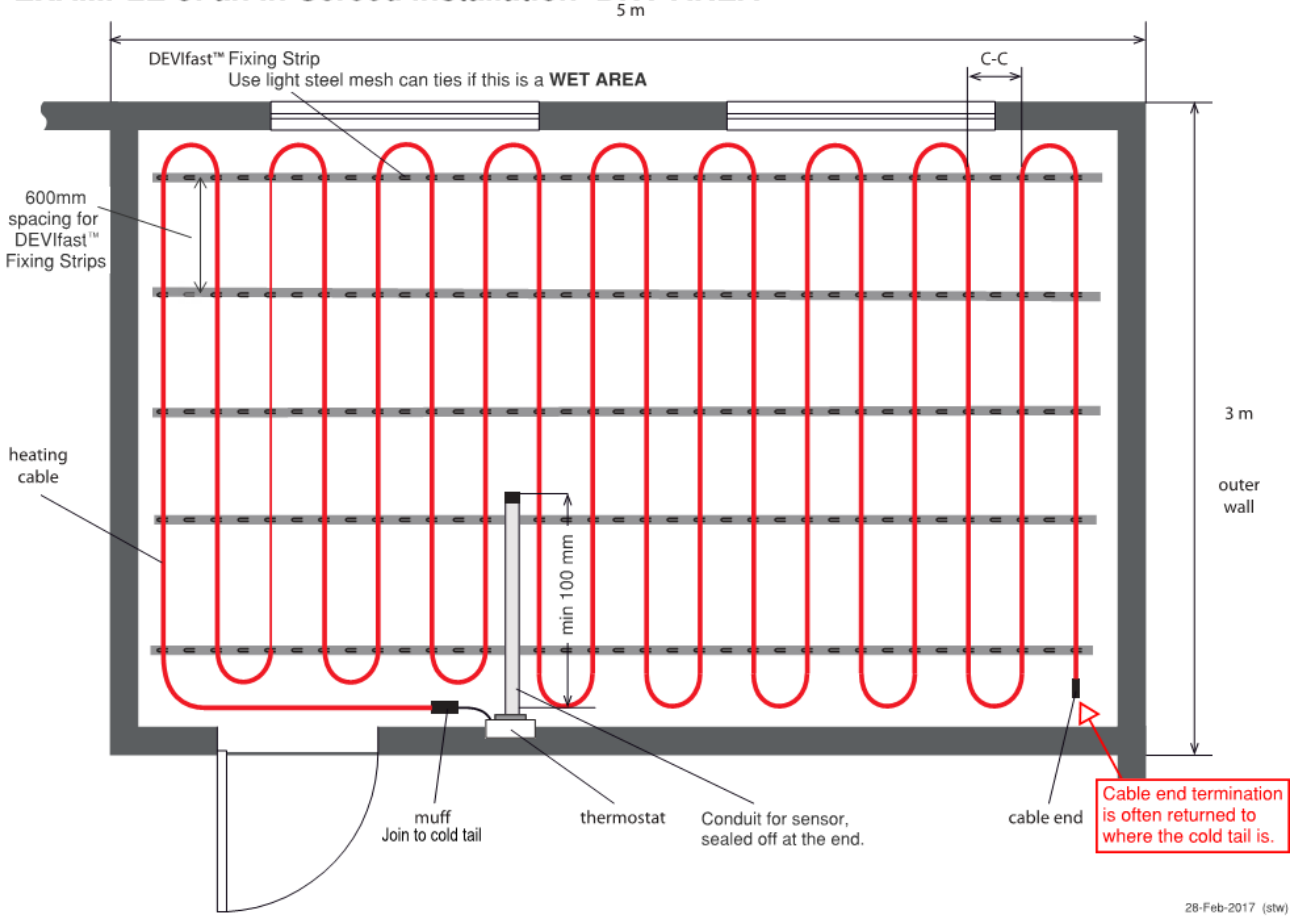


6.6 IN-SCREED CABLING DEVIflex™ 18T, DEVIflex™ 10T and DSIG Cables

Where In-Screed heating cables are to be installed over a bare concrete floor or similar surface, even spacing can be achieved by using DEVIfast™ Fixing Strips or by attaching the cables to a light steel mesh with ties or clips at no more than 200 mm spacing (refer table in the *Heating Cable Spacing* section, page 10). The whole assembly may rest on a clean concrete slab free from sharp objects, and be covered with sufficient screed to ensure the cable is a minimum of 20 mm from the finished surface (unless this is a custom design for a specific construction method). Most floor coverings are suitable, e.g. marble, ceramic tiles, slate, carpet or timber, though suppliers of some floor surfaces can have specific requirements.

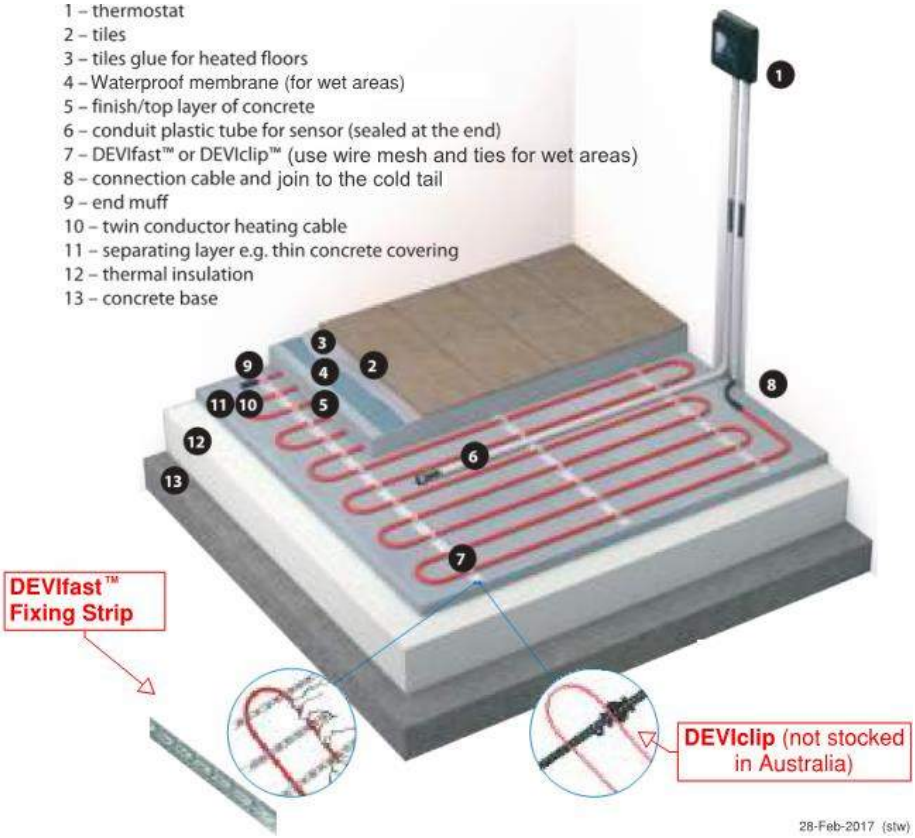
Note:
A sketch or photograph record of the installation must show the approximate location of the heating cable(s), the sensor conduit(s), the active and the neutral terminations. A copy should remain with the installation for the benefit of future owners/occupiers. This can be used to locate the heating cables for any future work or for later modifications to floor/layout construction.

EXAMPLE of an In-Screed installation DRY AREA



EXAMPLE of the In-Screed installation method

1 – thermostat
2 – tiles
3 – tiles glue for heated floors
4 – Waterproof membrane (for wet areas)
5 – finish/top layer of concrete
6 – conduit plastic tube for sensor (sealed at the end)
7 – DEVIfast™ or DEVIclip™ (use wire mesh and ties for wet areas)
8 – connection cable and join to the cold tail
9 – end muff
10 – twin conductor heating cable
11 – separating layer e.g. thin concrete covering
12 – thermal insulation
13 – concrete base



6.7 THIN FLOORS

The cables in this Installation Guide are not suitable for Thin Floors. Please refer to the Installation Guide for Devimat™ cables.

6.8 HEATING OF TIMBER FLOORS

Heating can be installed under timber floors but it is important to determine the specification requirements for the particular timber to be installed. As a rule-of-thumb guide, the surface temperature of a timber floor must not exceed 27°C but timber floors vary in their requirements and a few timber floors do not like being heated at all because they can dry out, crack or warp where there is underfloor heating. Please obtain the timber floor specifications from your timber supplier.

The lower heating power rating for this floor heating means that it is usually regarded as providing background heating rather than a comfort heat level. The DEVIflex™ 10T heating cables are designed specifically where there will be timber floor or other sensitive floor surfaces over a cement screed, because they have a lower heat output (10W/m).

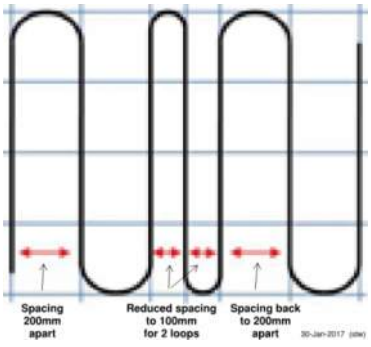
Timber floors must have a thermostat that will limit the maximum temperature that the floor is permitted to heat to, regardless of what the user may select as a comfort level. The DEVIreg™ Touch, DEVIreg™ Smart, DEVIreg™ 532, and DEVIreg™ 535 incorporate this function but they must be correctly configured to ensure that the limit is set. The DEVIRreg™ 532 is a manual thermostat (often used with Home Automation systems) whereas the others are programmable thermostats.

The most common method of heating a timber floor is by incorporating the heating in a slab, screed or levelling bed, with the timber then laid on top of this in thermal contact with the heated surface.

Please contact us if you need further information for heating under timber floors.

6.9 CABLE LAYING

Where even spacing is not practical, then heating cable runs can have a variable spacing, as shown in this example. However, the heating cables are not permitted to be closer to each other than the minimum spacing for the cable for that installation construction method (refer table in the *Heating Cable Spacing* section, page 10).



How to lay the heating cables

1. Refer to the preceding sections for details on laying. Note that the recommended cable spacing, floor thicknesses and thermal insulation are all important to achieve a warm floor with even distribution of heat, and to provide comfortable temperature on the floor surface that operates economically. The floor surface temperature variation should not exceed 1.5°C.
2. The entire length of evenly spaced heating cable, including the heating cable termination(s) to the cold tails, must be embedded in concrete or the sand/cement screed.

3. Heating cable spacing shall be as even as practical across the entire heated area, with reference to the design power requirements and maximum cable loading.

4. Heating cables should be laid so as to avoid walls, water pipes, drains, baths, toilets, vanities, wardrobes, built-ins, fixtures, etc., and where it is known that permanent structures are to be installed above the finished floor, or where the floor is likely to be penetrated by nails, door stops, or other fixings.

5. Generally, cables should be no closer than 50 mm to any wall or fixed item (refer table in the *Heating Cable Selection and Spacing* section, page 10).

6. Heating cables must be gently but securely fixed in place so that there is no possibility of the cable being moved, deformed, or the outer sheath being indented in any way during installation or construction.

7. To avoid accidental damage, the cables should be covered as soon as possible with the concrete/screed or mortar bed. The cover needs to ensure that there are not air pocket voids near the heating cables. It must not contain any sharp stones or other objects.

6.10 CONNECTION of HEATING CABLES

1. All power connections to floor heating cables must be by permanent wiring (i.e. no plug/socket connections) and the connection must be done by a licensed electrician. The cables have an earth braid/shield and every end of all cold tails must be connected to the installation Earth.

2. All heating cables must be protected by a Residual Current Device (RCD).

3. For loads where Contactors are required, the cold tails should terminate in a wall box above the floor level and in reasonable close proximity to where they exit from the floor. If the thermostats supplied are capable of switching the load, the cold tails should be taken directly to the thermostat position.

Note:
It is important to check the type and rating of the thermostat being used to determine if control wiring with a contactor is required. All DEVIreg™ thermostats require a contactor if the load is greater than 2,700 watts or 12A (75% of 15 Amps). Contactors are usually located in a switchboard so additional wiring runs may be required.

7 Thermostats

There is a range of programmable and manual thermostats available to choose from. Most installations have the programmable type wall-mounted in-room thermostats. The manual thermostats are for simpler installations and are recommended to be installed where a Home Automation / Building Management System controls when the heating is required.

Both of the fully programmable **DEVIreg™ Touch** and **DEVIreg™ Smart** thermostats have a 5-year warranty. They are intuitive, wall mounted semi-recessed, floor/ceiling and room sensing thermostats with intelligent timer functions that are simple to use.

- DEVIreg™ Touch is programmed through its backlit touch sensitive screen
- DEVIreg™ Smart uses Wi-Fi access and the DEVIsmart App (iOS and Android) for programming, and can be controlled from anywhere the mobile device has Wi-Fi or data access. This thermostat also has a touch screen for basic in-room functions.

We would like to assist you to determine which thermostat is the most appropriate for your installation. You can give us a call, or Information on the range of thermostats can be seen on our web site at http://www.devexsystems.com.au/shop/category/thermostats-floor--air-sensing .

7.1 THERMOSTAT SETTING

A comfortable floor temperature is described in International Standard ISO/ TS 13732-2. The generally regarded maximum long term comfort floor surface temperature is defined as 29.5°C but the following table may be a better guide for the thermostat comfort setting. Programmable thermostats (above) default to the settings in this table when set up using the wizard.

TYPE OF INSTALLATION	TEMPERATURE	
	Suggested Initial Thermostat Setting	NOTES
	°C	
Tiles - Bathroom	31	
Tiles - Living area	27-29	
Hardwood	25-27 *	Must not exceed timber specification.
Timber Laminate	24-27 *	Must not exceed timber specification.
Carpet	23-25	Set higher for this surface temperature.
** Requirements vary for different timber floors. Installed thermostats must limit user temperature setting.*		
Refer also to the DEVIreg™ Smart Installation Guide (Section 7 "Settings" pages 20-21).		
Inactive people often prefer temperatures to be 1 or 2°C warmer.		
Some users may prefer just to take the edge of the cold floor (economy), or like it to be very warm.		
		30-Jan-17

The type of floor surfaces during the life-time of a dwelling can often change, just as the comfort temperature perception differs with different individuals. It is therefore advised to install the heating system for a maximum comfort floor temperature level so that it can satisfy future possible options, though often a floor temperature which is just a few degrees above the current room temperature can satisfy the needs of many users.

Refer to *Heating of Timber Floors* section, page 15, for these requirements.
We would like to assist you to determine which thermostat is the most appropriate for your installation.

Thermostat installation and programming guides are available on the Devex web site or directly from Devex Systems - http://www.devexsystems.com.au/electric-and-hydronic-floor-heating-documentation.html .

7.2 WIRING of THERMOSTATS

Power supply and all connections to the heating system must be in accordance with AS/NZS 3000 Wiring Rules. The supply must be through a RCD (Residual Current Device). The power supply is normally directly to the thermostat "L" and "N" terminals, with the heating cables connected directly to the thermostat "L-load" and "N-load" terminals.

The floor sensor thermostat probe connects to the terminals marked "NTC" (Negative Temperature Coefficient). The sensors measure 15K ohms when at 25°C.

If the power consumption is greater than 2,700W (12A) then a contactor must be used. The contactor is usually located in an electrical switchboard. Power needs to run from the switchboard RCD to the thermostat, then to the contactor location, then from the contactor to the floor heating cable.

Our thermostats include a wiring diagram on the thermostat. Please contact us if you need further details for connecting thermostats or contactor connections.

8 Warranty

20-year DEVI Warranty™ is valid for most of DEVI® heating mats and heating cables. DEVI® support Full service warranty for cables and mats installed indoor for floor heating, provided the Installation Guide has been followed – including costs for installation and floor materials such as damage to bricklaying and tiles. Full Service 20-year warranty implies that when there is a warranty case DEVI® undertakes a responsibility to correct the defect free of charge or offer product replacement during the warranty period. In addition, DEVI® covers all reasonable costs associated with the replacement of any heating system element and floor cover restoration costs.

Please refer to our Warranty statement for full details.

9 Other Heating Applications

There are many applications for heating cables of various types that we can supply, for example,

- Heating of seats in spas and outdoor areas with cold climates;
- Heating of playing fields with natural or artificial grass;
- Soil warming in greenhouses;
- Heating of agricultural premises;
- Frost protection of floors and foundations of freezers and ice stadiums, including threshold and door heating;
- Condensation protection under cold store floors;
- Ice protection and snow melting for roofs, gutters and drainage systems;
- Ice and snow melting on ground – e.g. roads, pavements, pedestrian walkways, bridges;
- Protection against freezing and for temperature maintenance of pipelines, tanks and other industrial applications;

as well as many other heating solutions.

Apart from electric under floor heating solutions Devex supplies and installs hydronic (water based) under floor heating. We also have a range of overhead electric and gas radiant heating products and HVAC solutions.

Devex® systems

heating & cooling excellence

Devex Systems specialises in heating & cooling solutions for new and existing buildings in residential, commercial and industrial environments.

For more information on any of our product lines, please contact us at:
1800 636 091 or **info@devexsystems.com.au**
www.devexsystems.com.au