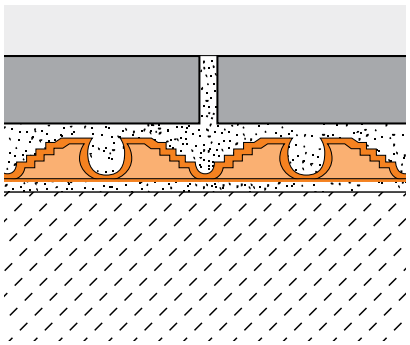
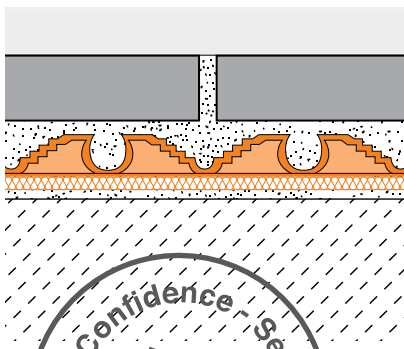
Schluter®
Systems

Schluter®-DITRA-HEAT Installation Handbook





Confidence - Security
Schluter Systems
PROFILE OF INNOVATION
Since 1975

Electric Floor Warming System with Integrated Uncoupling Technology

04/2025

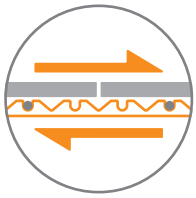
Schluter®-DITRA-HEAT

Electric Floor Warming System with Integrated Uncoupling Technology

Ceramic and stone tiles are the ideal surface coverings because they are durable, easy to maintain, and hygienic. However two common barriers to the selection of tile as a floor covering are concerns about cracking and the perception that tiles are cold.

Floor warming systems are a growing trend in tile applications, but none address concerns about cracking. A viable installation system must address the magnified fluctuations in temperature that contribute to increased shear stresses between the substrate and the tile covering. **Schluter®-DITRA-HEAT** integrates customizable, comfortable electric floor warming with the functions associated with DITRA: uncoupling, waterproofing, vapor management and support to ensure a long lasting installation. DITRA-HEAT is primarily intended to warm tile floors and make them more comfortable underfoot, but can contribute to space heating. DITRA-HEAT is also suitable for applications with alternate floor coverings such as engineered wood, luxury vinyl, wood and stone plastic composite, and laminate flooring.

DITRA-HEAT combines the flexibility of loose heating cables with the ease of installation of mat systems. Cables can be placed wherever heat is desired, without creating height differences in the floor. Self-leveling compounds are not required to encapsulate the cables for ceramic, porcelain, and stone tiles, significantly reducing installation time and effort compared to uncoupling membranes over other electric floor warming systems. Self-leveling compounds are approved for use only when installing alternative floor coverings over the DITRA-HEAT membranes.



Uncoupling

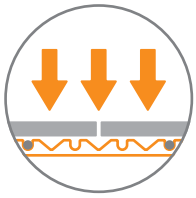
Tile has been successfully installed for thousands of years by incorporating an uncoupling layer, or forgiving shear interface, within the tile assembly. **DITRA-HEAT** provides uncoupling through its geometric configuration, which allows for in-plane movement that effectively neutralizes the differential movement stresses between the substrate and the tile, thus eliminating the major cause of cracking and delaminating of the tiled surface.

Waterproofing

DITRA-HEAT provides reliable waterproofing. Its polypropylene composition protects the substrate from moisture penetration, which is particularly important in today's building environment where most substrates are moisture sensitive.

Vapor Management

The free space on the underside of **DITRA-HEAT** provides a route for excess moisture and vapor to escape from the substrate that could otherwise cause damage to the tile covering above. Thus, DITRA-HEAT effectively manages moisture beneath the tile covering.



Support/Load Distribution

When placed on a solid foundation, columns or pillars can support tremendous loads. The same physical principle applies to **DITRA-HEAT** installations. Column-like mortar structures are formed in and between the studs on the surface of the matting. Loads are transferred from the tile covering through these column-like mortar structures to the substrate. Since DITRA-HEAT is virtually incompressible within the tile assembly, the advantages of uncoupling are achieved without sacrificing point load distribution capabilities.

Legend	
★★★	Essential
★★	Significant
★	Helpful

Schluter-Systems' written installation instructions shall have precedence over referenced industry standard guidelines and installation procedures insofar as referenced information may contain overlapping or conflicting requirements. Type, thickness, and format of the ceramic or stone tile surface covering must be suitable for the intended application.

CONTENTS

Heating cables must be installed by a qualified person in accordance with this handbook and with the National Electrical Code (USA) or Canadian Electrical Code Part I (CAN) as applicable. All electrical connections must be made by a qualified person, according to the electrical and building codes effective in your region.

This installation handbook is subject to change without notice. Please visit www.schluter.com for the latest version.

WOOD

Every substrate presents unique challenges

All wood materials, including OSB, plywood, and framing members, are subject to expansion, contraction, bending, and deflection as a result of changes in moisture content and loading. Further, these deformations fluctuate over the life of the building structure.

The uncoupling function of **Schluter®-DITRA-HEAT** protects the ceramic or stone tile covering from the aforementioned deformations by neutralizing the differential movement stresses between the wood structure and the tile, thus eliminating the major cause of cracking and delaminating of the tiled surface. Therefore, DITRA-HEAT can replace a second layer of plywood in most applications.

Since wood structures are sensitive to moisture, the **DITRA-HEAT** membrane's waterproofing function adds an essential element to the flooring assembly by providing simple, effective, and permanent moisture protection.

Wood continually absorbs and releases moisture. The free space beneath the **DITRA-HEAT** membrane allows the wood to breathe and provides a route for any residual moisture in the wood substrate to escape.

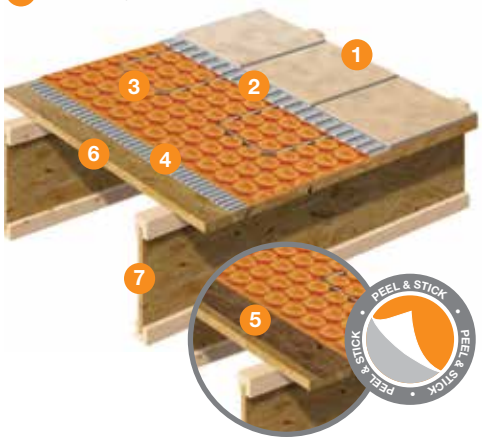
Since **DITRA-HEAT** is virtually incompressible within the tile assembly, the advantages of uncoupling are achieved without sacrificing point load distribution capabilities.

By addressing all of the challenges associated with today's fast, lightweight construction methods, **DITRA-HEAT** provides a durable installation system for ceramic and stone tile over wood substrates.

DITRA-HEAT combines the flexibility of loose heating cables with the ease of installation of mat systems. Cables can be placed wherever heat is desired, without creating height differences in the floor. Self-leveling compounds are not required to encapsulate the cables, significantly reducing installation time and effort compared to uncoupling membranes over other electric floor warming systems. Self-leveling compounds are approved for use only when installing alternative floor coverings over the DITRA-HEAT membranes.

DH-W16-T and DHPS-W16-T

1. Ceramic or porcelain tile
2. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
3. **DITRA-HEAT/-PS** or **DITRA-HEAT-DUO/-PS** uncoupling membrane and heating cables
4. **ALL-SET, FAST-SET,** or modified thin-set mortar
5. **PRIMER-U/-PS**
6. Single layer of plywood or OSB
7. Joists, I-joists, or trusses



★★★ ★★★ ★ ★★

Floors, Interior - Ceramic or Porcelain Tile

16" *(406 mm)* o.c. joist spacing, single layer OSB or plywood subfloor

Areas of Application
- over any even and structurally sound OSB or plywood subfloor with 16" (406 mm) o.c. joist spacing
- interior dry or wet areas

Limitations
- minimum 2" x 2" *(50 mm x 50 mm)* tile
- for natural stone, see detail DH-W-S (page 6) and natural stone discussion (page 37)

Requirements
- maximum spacing of joists, I-joists, or floor trusses is 16" *(406 mm)* o.c.
- minimum subfloor thickness – 19/32", 5/8" nom. *(16 mm)* tongue-and-groove with 1/8" *(3 mm)* gap between sheets

Substrate Preparation
- verify that subfloor panels are properly fastened to framing members
- any leveling of the subfloor must be done prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- for optimal performance with difficult-to-bond-to substrates, use PRIMER-U/-PS or other primer suitable for the application. Contact Schluter-Systems to determine if PRIMER-U/-PS, or suitable primer, is required for the specific installation

Movement Joints
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS do not eliminate the need for movement joints, including perimeter joints, within the tiled surface. Movement joints must be installed in accordance with industry standards and norms; see page 14 of this Handbook, TCNA EJ171, and TTMAC 301 MJ

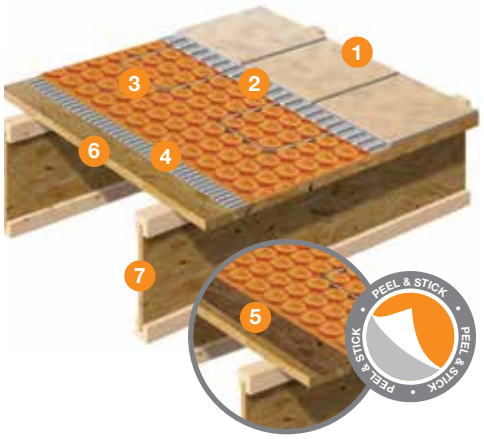
Setting and Grouting Materials
- modified thin-set mortar - ANSI A118.11
- unmodified thin-set mortar – ANSI A118.1
- grout – ANSI A118.3, A118.6, A118.7, A118.8

Setting and Grouting Specifications
- tile – ANSI A108.5
- grout – ANSI A108.6, A108.9, A108.10

Other Considerations
- tightly butted and/or tented plywood or OSB seams must be addressed prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- vapor barrier on crawl space floors according to regional building codes
- where a waterproof floor is required, all DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar; see page 11

DH-W19-T and DHPS-W19-T

1. Ceramic or porcelain tile
2. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
3. **DITRA-HEAT/-PS** or **DITRA-HEAT-DUO/-PS** uncoupling membrane and heating cables
4. **ALL-SET, FAST-SET,** or modified thin-set mortar
5. **PRIMER-U/-PS**
6. Single layer of plywood or OSB
7. Joists, I-joists, or trusses



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19.2" *(488 mm)* o.c. joist spacing, single layer OSB or plywood subfloor

Areas of Application
- over any even and structurally sound OSB or plywood subfloor with 19.2" *(488 mm)* o.c. joist spacing
- interior dry or wet areas

Limitations
- minimum 2" x 2" *(50 mm x 50 mm)* tile
- for natural stone, see detail DH-W-S (page 6) and natural stone discussion (page 37)

Requirements
- maximum spacing of joists, I-joists, or floor trusses is 19.2" *(488 mm)* o.c.
- minimum subfloor thickness – 23/32", 3/4" nom. *(19 mm)* tongue-and-groove with 1/8" *(3 mm)* gap between sheets

Substrate Preparation
- verify that subfloor panels are properly fastened to framing members
- any leveling of the subfloor must be done prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- for optimal performance with difficult-to-bond-to substrates, use PRIMER-U/-PS or other primer suitable for the application. Contact Schluter-Systems to determine if PRIMER-U/-PS, or suitable primer, is required for the specific installation

Movement Joints
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS do not eliminate the need for movement joints, including perimeter joints, within the tiled surface. Movement joints must be installed in accordance with industry standards and norms; see page 14 of this Handbook, TCNA EJ171, and TTMAC 301 MJ

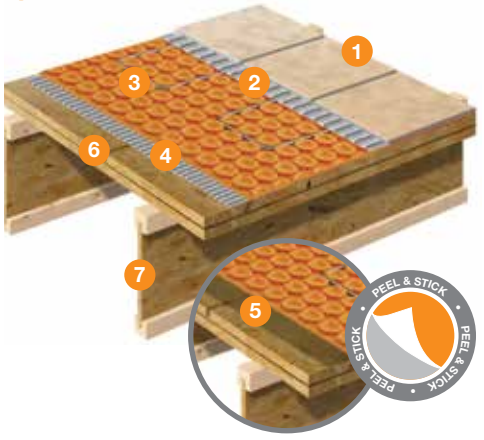
Setting and Grouting Materials
- modified thin-set mortar - ANSI A118.11
- unmodified thin-set mortar – ANSI A118.1
- grout – ANSI A118.3, A118.6, A118.7, A118.8

Setting and Grouting Specifications
- tile – ANSI A108.5
- grout – ANSI A108.6, A108.9, A108.10

Other Considerations
- tightly butted and/or tented plywood or OSB seams must be addressed prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- vapor barrier on crawl space floors according to regional building codes
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar; see page 11

DH-W24-T and DHPS-W24-T

1. Ceramic or porcelain tile
2. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
3. **DITRA-HEAT/-PS** or **DITRA-HEAT-DUO/-PS** uncoupling membrane and heating cables
4. **ALL-SET, FAST-SET,** or modified thin-set mortar
5. **PRIMER-U/-PS**
6. Double layer of plywood or OSB
7. Joists, I-joists, or trusses



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24" *(610 mm)* o.c. joist spacing, double layer OSB or plywood subfloor

Areas of Application
- over any even and structurally sound double layer OSB or plywood floor
- interior dry or wet areas

Limitations
- minimum 2" x 2" *(50 mm x 50 mm)* tile

Requirements
- maximum spacing of joists, I-joists, or floor trusses is 24" *(610 mm)* o.c.
- double layer wood floor consisting of:
  - minimum subfloor thickness – 23/32", 3/4" nom. *(19 mm)* tongue-and-groove
  - minimum underlayment thickness – 11/32", 3/8" nom. *(10 mm)*

Substrate preparation
- verify that subfloor panels are properly fastened to framing members
- underlayment – minimum 11/32", 3/8" nom. *(10 mm)*-thick Exposure 1, plugged-face plywood or OSB with 1/8" *(3 mm)* gap between sheets; see page 17 for underlayment installation guidelines
- any leveling of the subfloor must be done prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- for optimal performance with difficult-to-bond-to substrates, use PRIMER-U/-PS or other primer suitable for the application. Contact Schluter-Systems to determine if PRIMER-U/-PS, or suitable primer, is required for the specific installation

Movement Joints
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS do not eliminate the need for movement joints, including perimeter joints, within the tiled surface. Movement joints must be installed in accordance with industry standards and norms; see page 14 of this Handbook, TCNA EJ171, and TTMAC 301 MJ

Setting and Grouting Materials
- modified thin-set mortar - ANSI A118.11
- unmodified thin-set mortar – ANSI A118.1
- grout – ANSI A118.3, A118.6, A118.7, A118.8

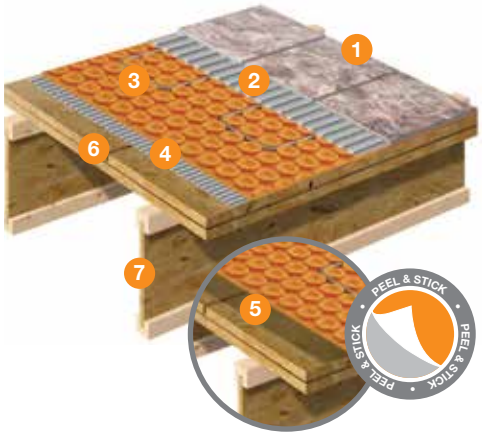
Setting and Grouting Specifications
- tile – ANSI A108.5
- grout – ANSI A108.6, A108.9, A108.10

Other Considerations
- tightly butted and/or tented plywood or OSB seams must be addressed prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- vapor barrier on crawl space floors according to regional building codes
- where a waterproof floor is required, all DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar; see page 11

Floors, Interior - Natural Stone Tile

Double layer of OSB or Plywood subfloor

1. Natural stone tile
2. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
3. **DITRA-HEAT/-PS** or **DITRA-HEAT-DUO/-PS** uncoupling membrane and heating cables
4. **ALL-SET, FAST-SET,** or modified thin-set mortar
5. **PRIMER-U/-PS**
6. Double layer of plywood or OSB
7. Joists, I-joists, or trusses



Areas of Application
- over any even and structurally sound double layer OSB or plywood floor
- interior dry or wet areas

Limitations
- requires double layer wood floor regardless of joist spacing
- minimum 2" x 2" *(50 mm x 50 mm)* tile

Requirements
- maximum spacing of joists, I-joists, or floor trusses is 24" *(610 mm)* o.c.
- double layer wood floor consisting of:
  - minimum subfloor thickness – 23/32", 3/4" nom. *(19 mm)* tongue-and-groove
  - minimum underlayment thickness – 11/32", 3/8" nom. *(10 mm)*

Substrate Preparation
- verify that subfloor panels are properly fastened to framing members
- underlayment – minimum 11/32", 3/8" nom. *(10 mm)*-thick Exposure 1, plugged-face plywood or OSB with 1/8" *(3 mm)* gap between sheets; see page 17 for underlayment installation guidelines
- any leveling of the subfloor must be done prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- for optimal performance with difficult-to-bond-to substrates, use PRIMER-U/-PS or other primer suitable for the application. Contact Schluter-Systems to determine if PRIMER-U/-PS, or suitable primer, is required for the specific installation

Movement Joints
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS do not eliminate the need for movement joints, including perimeter joints, within the tiled surface. Movement joints must be installed in accordance with industry standards and norms; see page 14 of this Handbook, TCNA EJ171, and TTMAC 301 MJ

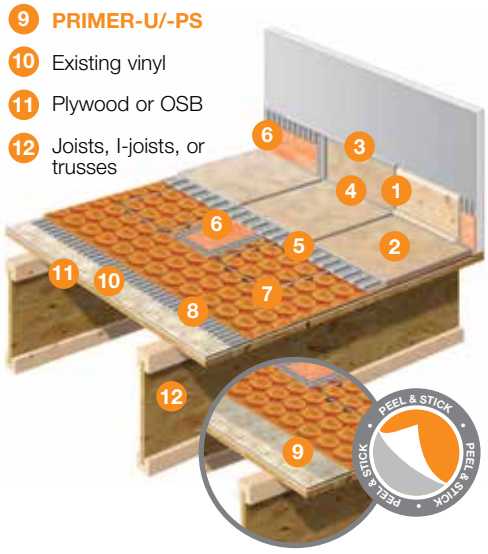
Setting and Grouting Materials
- modified thin-set mortar - ANSI A118.11
- unmodified thin-set mortar – ANSI A118.1
- grout – ANSI A118.3, A118.6, A118.7, A118.8

Setting and Grouting Specifications
- tile – ANSI A108.5
- grout – ANSI A108.6, A108.9, A108.10

Other Considerations
- certain moisture-sensitive stones, e.g., green marble, or resin-backed tiles may require special setting materials. Consult stone supplier and Schluter-Systems for more information
- tightly butted and/or tented plywood or OSB seams must be addressed prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- vapor barrier on crawl space floors according to regional building codes
- where a waterproof floor is required, all DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar; see page 11

DH-V-T and DHPS-V-T

1. Tile or wood base
2. Ceramic, porcelain, or stone tile
3. **RONDEC**
4. **DILEX-EKE**
5. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
6. **KERDI-BAND**
7. **DITRA-HEAT/-PS** or **DITRA-HEAT-DUO/-PS** uncoupling membrane and heating cables
8. **FAST-SET** or fast-setting modified thin-set mortar
9. **PRIMER-U/-PS**
10. Existing vinyl
11. Plywood or OSB
12. Joists, I-joists, or trusses



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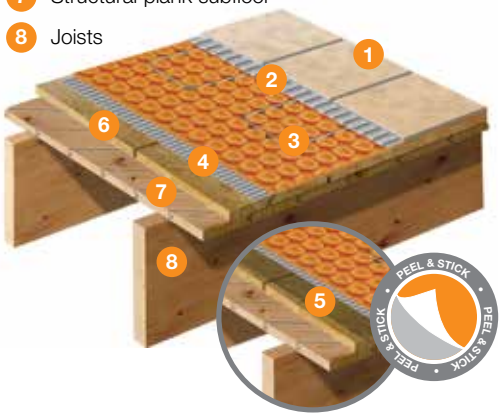
DH-SP-TS and DHPS-SP-TS

1. Ceramic, porcelain, or stone tile
2. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
3. **DITRA-HEAT/-PS** or **DITRA-HEAT-DUO/-PS** uncoupling membrane and heating cables
4. **ALL-SET, FAST-SET,** or modified thin-set mortar
5. **PRIMER-U/-PS**
6. Plywood or OSB underlayment
7. Structural plank subfloor
8. Joists



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Floors, Interior - Existing Vinyl Floors

Areas of Application
- over any even and structurally sound substrate with existing vinyl flooring
- interior dry or wet areas

Limitations
- minimum 2" x 2" *(50 mm x 50 mm)* tile
- cushioned vinyl unacceptable
- perimeter bonded vinyl flooring unacceptable
- multiple layers of vinyl unacceptable
- lauan plywood and particle board underlayments are unacceptable substrates directly beneath DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS and must be removed and/or replaced with plywood or OSB prior to membrane installation. However, lauan and particle board are acceptable directly beneath the existing vinyl

Requirements
- for wood substrates, subfloor/underlayment configuration according to detail DH-W16-T, DH-W19-T, DH-W24-T, or DH-W-S

Substrate Preparation
- ensure that the structure beneath the vinyl is sound and adequate
- ensure that vinyl is well adhered
- remove any wax and clean vinyl
- for wood substrates, nail off floor with ring shank flooring nails every 4" *(102 mm)* o.c. – fasteners must pass through entire thickness of assembly with minimal penetration into joists
- any leveling of the subfloor must be done prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- for optimal performance with difficult-to-bond-to substrates, use PRIMER-U/-PS or other primer suitable for the application

Movement Joints
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS do not eliminate the need for movement joints, including perimeter joints, within the tiled surface. Movement joints must be installed in accordance with industry standards and norms; see page 14 of this Handbook, TCNA EJ171, and TTMAC 301 MJ

Setting and Grouting Materials
- Fast-setting modified thin-set mortar - ANSI A118.4F or ANSI A118.15F
- unmodified thin-set mortar – ANSI A118.1
- grout – ANSI A118.3, A118.6, A118.7, A118.8

Setting and Grouting Specifications
- tile – ANSI A108.5
- grout – ANSI A108.6, A108.9, A108.10

Other Considerations
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS are adhered to the vinyl flooring using Schluter FAST-SET or fast-setting modified thin-set mortar suitable for bonding to vinyl. As an alternative, a suitable cement-based embossing leveler or Schluter ALL-SET or an appropriate modified thin-set mortar can be used to skim coat the vinyl to provide a bonding surface. When skim coat is cured, DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS are adhered to the skim coat using Schluter SET or unmodified thin-set mortar. See page 27 for discussion on latex-modified thin-set mortars sandwiched between two impervious layers
- seaming DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS, including floor/wall connections, with KERDI-BAND may be appropriate in cases where a break in the water line of an ice maker or dishwasher can damage pre-existing moisture-sensitive substrates and underlayments. KERDI-BAND floor/wall connections are just as easily concealed with wood base as with tile. KERDI-BAND floor/wall connections in dishwasher alcoves are parged with thin-set mortar; see page 11
- vapor barrier on crawl space floors according to regional building codes
- certain moisture-sensitive stones, e.g., green marble, or resin-backed tiles may require special setting materials. Consult stone supplier and Schluter-Systems for more information

Floors, Interior - Structural Plank Subfloor

Areas of Application
- over structural plank subfloors
- interior dry or wet areas

Limitations
- minimum 2" x 2" *(50 mm x 50 mm)* tile

Requirements
- maximum spacing of joists is 24" *(610 mm)* o.c.
- double layer wood floor consisting of:
  - minimum structural plank subfloor thickness – 3/4" *(19 mm)*
  - minimum underlayment thickness – 15/32", 1/2" nom. *(13 mm)*

Substrate Preparation
- verify that subfloor planks are properly fastened to framing members
- underlayment – minimum 15/32", 1/2" nom. *(13 mm)*-thick Exposure 1, plugged-face plywood or OSB with 1/8" *(3 mm)* gap between sheets; see page 17 for underlayment installation guidelines
- any leveling of the subfloor must be done prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- for optimal performance with difficult-to-bond-to substrates, use PRIMER-U/-PS or other primer suitable for the application. Contact Schluter-Systems to determine if PRIMER-U/-PS, or suitable primer, is required for the specific installation

Movement Joints
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS do not eliminate the need for movement joints, including perimeter joints, within the tiled surface. Movement joints must be installed in accordance with industry standards and norms; see page 14 of this Handbook, TCNA EJ171, and TTMAC 301 MJ

Setting and Grouting Materials
- modified thin-set mortar - ANSI A118.11
- unmodified thin-set mortar – ANSI A118.1
- grout – ANSI A118.3, A118.6, A118.7, A118.8

Setting and Grouting Specifications
- tile – ANSI A108.5
- grout – ANSI A108.6, A108.9, A108.10

Other Considerations
- vapor barrier on crawl space floors according to regional building codes
- where a waterproof floor is required, all DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar; see page 11
- certain moisture-sensitive stones, e.g., green marble, or resin-backed tiles may require special setting materials. Consult stone supplier and Schluter-Systems for more information

CONCRETE

Every substrate presents unique challenges

There are various challenges associated with the installation of hard surface coverings on concrete substrates.To begin, the coefficient of thermal expansion of concrete is close to twice that of ceramic tile. Additionally, tile contractors are often expected to install tile over young concrete (concrete cured less than 28 days). However, rigid surface coverings installed over young concrete are susceptible to damage as a result of shrinkage during curing. Pre-stressed/post-tensioned concrete slabs are also commonplace in today's construction environment. Although pre-stressing is used to help control deflections in concrete structures, these slabs are still subject to deformations caused by changes in moisture, temperature, and loading. Many concrete slabs on or below grade are subject to moisture migration, which can be problematic. Furthermore, these structures experience the same deformations as stated above.

The uncoupling function of **Schluter®-DITRA-HEAT** protects the ceramic or stone tile covering by neutralizing the differential movement stresses between the concrete substrate and the tile, thus eliminating the major cause of cracking and delaminating of the tiled surface.

The **DITRA-HEAT** membrane's waterproofing ability not only protects the substrate from harmful substances, it also slows the drying of fresh concrete, which reduces the chances of cracking and curling of the slab.

The configuration of the **DITRA-HEAT** matting provides free space to accommodate vapor emissions from the concrete slab. This allows the installation of DITRA-HEAT and the tile covering as soon as the slab can be walked upon. Vapor management is also essential for slabs subject to moisture migration.

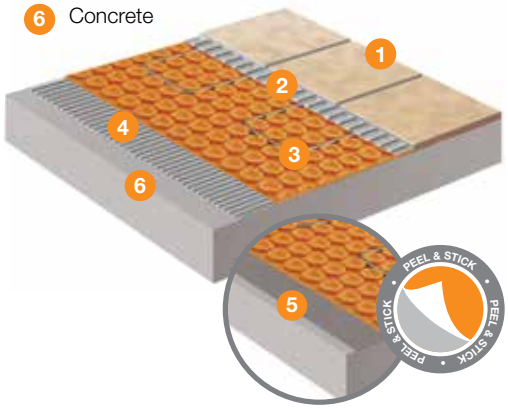
Since **DITRA-HEAT** is virtually incompressible within the tile assembly, the advantages of uncoupling are achieved without sacrificing point load distribution capabilities.

By addressing all of the challenges associated with today's fast construction methods, **DITRA-HEAT** provides a durable installation system for ceramic and stone tile over concrete substrates.

DITRA-HEAT combines the flexibility of loose heating cables with the ease of installation of mat systems. Cables can be placed wherever heat is desired, without creating height differences in the floor. Self-leveling compounds are not required to encapsulate the cables, significantly reducing installation time and effort compared to uncoupling membranes over other electric floor warming systems. Self-leveling compounds are approved for use only when installing alternative floor coverings over the DITRA-HEAT membranes. Concrete substrates can absorb heat energy increasing the time it takes for floors to warm up, particularly when there is no insulation layer below the concrete. In some cases, floors may never reach the desired temperature. DITRA-HEAT-DUO features an integrated thermal break to reduce sound transmission through floor-ceiling assemblies, reduce heat loss to concrete substrates, and improve floor warming response times.

DH-C-TS and DHPS-C-TS

1. Ceramic, porcelain, or stone tile
2. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
3. **DITRA-HEAT/-PS** or **DITRA-HEAT-DUO/-PS** uncoupling membrane and heating cables
4. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
5. **PRIMER-U/-PS**
6. Concrete



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Floors, Interior - Ceramic or Stone Tile

Concrete subfloor

Areas of Application
- over any structurally sound and even concrete subfloor
- young concrete (concrete cured less than 28 days).
- on or below grade concrete subject to moisture migration
- post-tensioned or pre-stressed concrete
- cracked concrete

Limitations
- minimum 2" x 2" *(50 mm x 50 mm)* tile
- concrete slabs subject to moisture migration must have all seams in DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS sealed with KERDI-BAND using Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar
- any cracks in concrete subfloor must exhibit in-plane movement only; thin-set tile assemblies, including those incorporating DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS, cannot accommodate differential vertical displacement

Requirements
- slab to be structurally sound
- slab to be free of waxy or oily films and curing compounds (when present, mechanical scarifying is necessary)
- the installation of DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS and tile can begin as soon as the slab can be walked upon
- DITRA-HEAT-PS / DITRA-HEAT-DUO-PS ONLY The maximum allowable moisture vapor emission rate (MVER) of the slab is 8 lbs. per 1,000 sq. ft. (3.62 kg per 92.9 m^2) per 24 hours using an ASTM 1869 calcium chloride test kit. Do not install when the relative humidity of concrete slabs exceeds 85% (ASTM F2170).
- slab to be free of standing water
- sound control floors - Schluter perimeter movement joints recommended to help limit sound energy transfer

Substrate Preparation
- any leveling of the subfloor must be done prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS
- for optimal performance with difficult-to-bond-to substrates, use PRIMER-U/-PS or other primer suitable for the application

Movement Joints
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS do not eliminate the need for movement joints, including perimeter joints, within the tiled surface. Movement joints must be installed in accordance with industry standards and norms; see page 14 of this Handbook, TCNA EJ171, and TTMAC 301 MJ

Setting and Grouting Materials
- unmodified thin-set mortar – ANSI A118.1
- grout – ANSI A118.3, A118.6, A118.7, A118.8

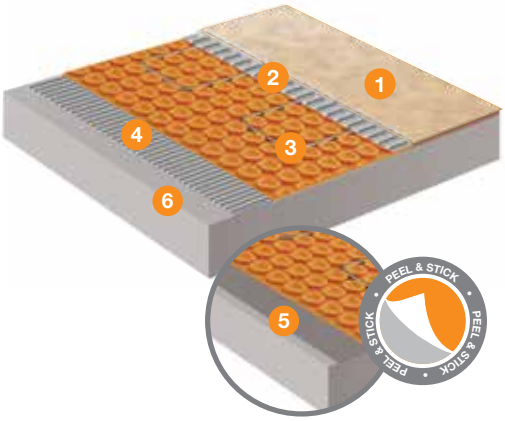
Setting and Grouting Specifications
- tile – ANSI A108.5
- grout – ANSI A108.6, A108.9, A108.10

Other Considerations
- where a waterproof floor is required, all DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS seams and floor/wall transitions must be sealed with KERDI-BAND using unmodified thin-set mortar; see page 11
- certain moisture-sensitive stones, e.g., green marble, or resin-backed tiles may require special setting materials. Consult stone supplier and Schluter-Systems for more information
- consider the use of DITRA-HEAT-DUO/-PS to improve the response time of DITRA-HEAT in applications over concrete. See page 34 for more information

Floors, Interior - Gauged Porcelain Tiles and Tile Panels

DH-C-GP and DHPS-C-GP

1. Gauged porcelain tiles or tile panels (7/32" *[5.5 mm]* and thicker)
2. **ALL-SET**
3. **DITRA-HEAT/-PS** uncoupling membrane and heating cables
4. **ALL-SET**
5. **PRIMER-U/-PS**
6. Concrete or gypsum concrete over concrete



Areas of Application

- over any structurally sound and even concrete subfloor
- over gypsum concrete underlayment placed over structurally sound concrete subfloors
- young concrete (concrete cured less than 28 days).
- on or below grade concrete subject to moisture migration
- post-tensioned or pre-stressed concrete
- cracked concrete
- interior dry or wet areas

Limitations

- minimum thickness of gauged porcelain tiles and tile panels 7/32" *(5.5 mm)*
- DITRA-HEAT/-PS membrane only (no DITRA-HEAT-DUO/-PS)
- recommended installations in normal commercial and light institutional areas such as public spaces of restaurants and hospitals. Commercial kitchen applications are not approved.
- DITRA-HEAT membrane and gauged porcelain tile panels must be installed with Schluter ALL-SET
- concrete subfloors and gypsum concrete underlayment over concrete subfloors only; no wood subfloors
- concrete slabs subject to moisture migration must have all seams in DITRA-HEAT/-PS sealed with KERDI-BAND
- any cracks in concrete subfloor must exhibit in-plane movement only; thin-set tile assemblies, including those incorporating DITRA-HEAT/-PS, cannot accommodate differential vertical displacement

Requirements

- slab to be structurally sound
- slab to be free of waxy or oily films and curing compounds (when present, mechanical scarifying is necessary)
- the installation of DITRA-HEAT/-PS and tile can begin as soon as the slab can be walked upon
- DITRA-HEAT-PS / DITRA-HEAT-DUO-PS ONLY The maximum allowable moisture vapor emission rate (MVER) of the slab is 8 lbs. per 1,000 sq. ft. (3.62 kg per 92.9 m^2) per 24 hours using an ASTM 1869 calcium chloride test kit. Do not install when the relative humidity of concrete slabs exceeds 85% (ASTM F2170).
- slab to be free of standing water
- gypsum – where radiant heat tubes are laid over the subfloor, gypsum poured to a height that is 3/4" *(19 mm)* above the tops of the tubes is required before DITRA-HEAT/-PS
- residual moisture in gypsum screed, 2.0% (percentage by volume) or less before installing DITRA-HEAT/-PS
- installation must conform to this handbook and ANSI A108.19, including, but not limited to, requirements for mortar coverage, movement joints, grout joint size, and lippage

Substrate Preparation

- any leveling or sloping of the slab or assembly must be done prior to installing DITRA-HEAT/-PS
- gypsum – follow manufacturer's directions
- for optimal performance with difficult-to-bond-to substrates, use PRIMER-U/-PS or other primer suitable for the application.

Movement Joints

- DITRA-HEAT/-PS does not eliminate the need for movement joints, including perimeter movement joints, within the tile surface. Movement joints must be installed in accordance with industry standards and norms; see page 14 of this Handbook, TCNA EJ171, and TTMAC 301 MJ
- concrete floors may incorporate various movement joints; see page 15 of this Handbook, for guidelines on how to treat the different types of joints (control/contraction joints, expansion joints, etc.)

Materials Specifications

- gauged porcelain tiles and tile panels – ANSI A137.3
- grout – ANSI A118.3, A118.7

Setting and Grouting Specifications

- tile – ANSI A108.19
- grout – ANSI A108.6, A108.10

Other Considerations

- since DITRA-HEAT/-PS must bond to the gypsum concrete, follow gypsum manufacturer's recommendations regarding primers and/or special surface preparation before installing DITRA-HEAT/-PS
- where a waterproof floor is required, all DITRA-HEAT/-PS seams and floor/wall transitions must be sealed with KERDI-BAND; see waterproofing details (DH-WP) on page 11 of this Handbook for more information

GYPSUM

Every substrate presents unique challenges

Bonding ceramic or stone tiles directly to gypsum underlayment substrates is generally considered questionable or not recommended. The challenges associated with gypsum-based underlayments include the requirement of an extended drying period before installing tile and continued sensitivity to the reintroduction of moisture throughout the life of the installation. In addition, since the coefficient of thermal expansion of gypsum underlayment is substantially greater than that of ceramic tile, shear stresses caused by temperature fluctuations can result in delamination or cracking of the tile covering. This is particularly important when gypsum underlayment is used as a thermal mass for hydronic radiant heated floors. With the increasing popularity of hydronic radiant heated floors, which typically utiliize gypsum underlayment, tile installers need a reliable installation system to address these issues.

The uncoupling function of **Schluter®-DITRA-HEAT** protects the ceramic or stone tile covering by neutralizing the differential movement stresses between the gypsum underlayment substrate and the tile, thus eliminating the major cause of cracking and delaminating of the tiled surface.

The **DITRA-HEAT** membrane's waterproofing function prevents the reintroduction of moisture to gypsum underlayment, which, if not prevented, could significantly compromise performance of the underlayment and lead to damage of the tiled surface.

The configuration of the **DITRA-HEAT** matting provides free space to accommodate vapor emissions from the gypsum.

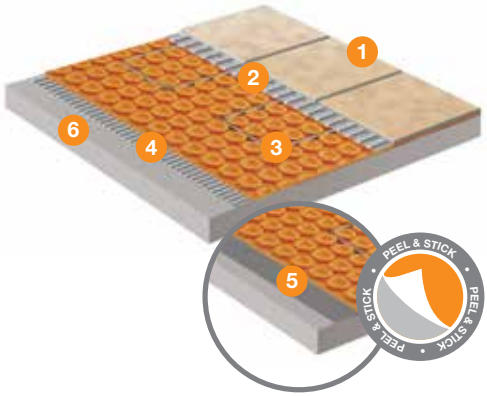
Since **DITRA-HEAT** is virtually incompressible within the tile assembly, the advantages of uncoupling are achieved without sacrificing point load distribution capabilities.

By addressing all of the challenges associated with today's fast, lightweight construction methods, **DITRA-HEAT** provides a durable installation system for ceramic and stone tile over gypsum substrates.

DITRA-HEAT combines the flexibility of loose heating cables with the ease of installation of mat systems. Cables can be placed wherever heat is desired, without creating height differences in the floor. Self-leveling compounds are not required to encapsulate the cables, significantly reducing installation time and effort compared to uncoupling membranes over other electric floor warming systems. Self-leveling compounds are approved for use only when installing alternative floor coverings over the DITRA-HEAT membranes. DITRA-HEAT is useful even in applications where hydronic radiant-heating tubes are incorporated in gypsum underlayment, as there may be times when floor warming is desirable while radiant heating is not necessary.

DH-G-TS and DHPS-G-TS

1. Ceramic, porcelain, or stone tile
2. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
3. **DITRA-HEAT/-PS** or **DITRA-HEAT-DUO/-PS** uncoupling membrane and heating cables
4. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
5. **PRIMER-U/-PS**
6. Gypsum underlayment



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Floors, Interior - Ceramic or Stone Tile

Gypsum underlayment

Areas of Application
- over gypsum underlayment placed over structurally sound wood or concrete subfloors
- interior dry or wet areas

Limitations
- minimum 2" x 2" *(50 mm x 50 mm)* tile
- DITRA-HEAT-DUO/-PS not recommended over heated floors

Requirements
- for wood substrates, subfloor/underlayment configuration according to detail DH-W16-T, DH-W19-T, or DH-W24-T.
- where radiant heat tubes are laid over the subfloor, gypsum poured to a height that is 3/4" *(19 mm)* above the tops of the tubes is required before installing DITRA-HEAT.
- residual moisture in gypsum screed, 2.0% (percentage by volume) or less before installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS.

Substrate preparation
- gypsum – follow manufacturer's directions
- for optimal performance with difficult-to-bond-to substrates, use PRIMER-U/-PS or other primer suitable for the application. Contact Schluter-Systems to determine if PRIMER-U/-PS, or suitable primer, is required for the specific installation

Movement Joints
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS do not eliminate the need for movement joints, including perimeter joints, within the tiled surface. Movement joints must be installed in accordance with industry standards and norms; see page 14 of this Handbook, TCNA EJ171, and TTMAC 301 MJ.

Setting and Grouting Materials
- unmodified thin-set mortar – ANSI A118.1
- grout – ANSI A118.3, A118.6, A118.7, A118.8

Installation Specifications
- gypsum – follow manufacturer's directions
- tile – ANSI A108.5
- grout – ANSI A108.6, A108.9, A108.10

Other Considerations
- since DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS must bond to the gypsum underlayment, follow gypsum manufacturer's directions regarding primers and/or special surface preparation before installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS.
- PRIMER-U suitable for use over gypsum underlayment. Refer to the PRIMER-U data sheet for more information.
- where a waterproof floor is required, all DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar; see page 11.
- certain moisture-sensitive stones, e.g., green marble, or resin-backed tiles may require special setting materials. Consult stone supplier and Schluter-Systems for more information.
- vapor barrier on crawl space floors according to regional building codes.

WATERPROOFING - FLOORS

Every substrate presents unique challenges

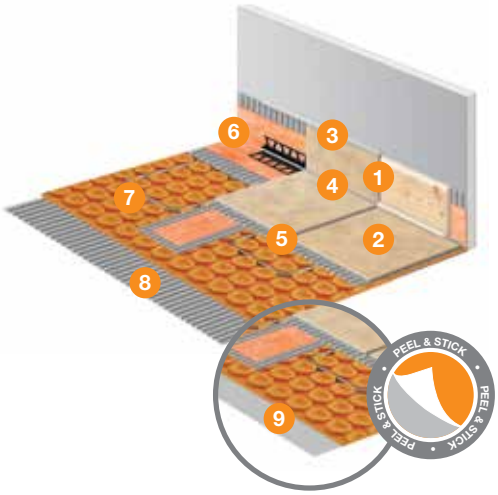
Today's construction methods, which include the use of lightweight, moisture-sensitive materials, such as plywood, OSB, and gypsum underlayment, have made the installation of hard surface coverings particularly challenging. If wood or gypsum underlayment substrates are exposed to moisture, the tile covering above can be damaged as a result.

Typical areas that require waterproofing include tub surrounds and showers. However, there are other commonly tiled areas that may, through unexpected circumstances, become exposed to significant amounts of water; for example, an overflowed toilet, or ruptured dishwasher, icemaker, or washing machine lines, which can result in flooding.

Waterproofing these floors can save an owner from replacing the tile assembly and substructure in the event of a leak. **Schluter®-DITRA-HEAT** and **DITRA-HEAT-DUO** installations can be made waterproof with minimal effort. Since the matting is made of waterproof polypropylene, the only extra step necessary is to seal the seams and floor/wall connections. This is easily accomplished by applying KERDI-BAND to these areas using Schluter SET®, Schluter, ALL-SET®, Schluter FAST-SET®, or an unmodified thin-set mortar. The result is a waterproof installation that will not suffer damage in the event of an unexpected water leak. KERDI-DRAIN or KERDI-LINE may be used to provide drainage in DITRA-HEAT and DITRA-HEAT-DUO installations.

DH-WP and DHPS-WP

1. Tile or wood base
2. Ceramic, porcelain or stone tile
3. **RONDEC**
4. **DILEX-EKE**
5. **SET, ALL-SET, FAST-SET,** or unmodified thin-set mortar
6. **KERDI-BAND**
7. **DITRA-HEAT/-PS** or **DITRA-HEAT-DUO/-PS** uncoupling membrane and heating cables
8. Thin-set mortar per appropriate detail
9. **PRIMER-U/-PS** per appropriate detail



Floors, Interior - Ceramic or Stone Tile

Areas of Application

- over any even and structurally sound substrate where waterproofing is desired

Limitations

- minimum 2" x 2" *(50 mm x 50 mm)* tile
- all DITRA-HEAT installations can be made waterproof by sealing the joints with KERDI-BAND. For applications requiring membrane compliance with or certification to the ANSI A118.10 American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation, select the DITRA-HEAT or DITRA-HEAT-DUO membranes that are installed with thin-set mortar. Alternatively, the DITRA-HEAT-PS or DITRA-HEAT-DUO-PS membranes may be covered with the KERDI membrane, which is certified to meet ANSI A118.10.

Requirements

- All seams in DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS matting and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar. **Note:** KERDI-BAND must lap DITRA-HEAT at seams and at floor/wall transitions by a minimum of 2" *(50 mm)* in order to maintain waterproof integrity

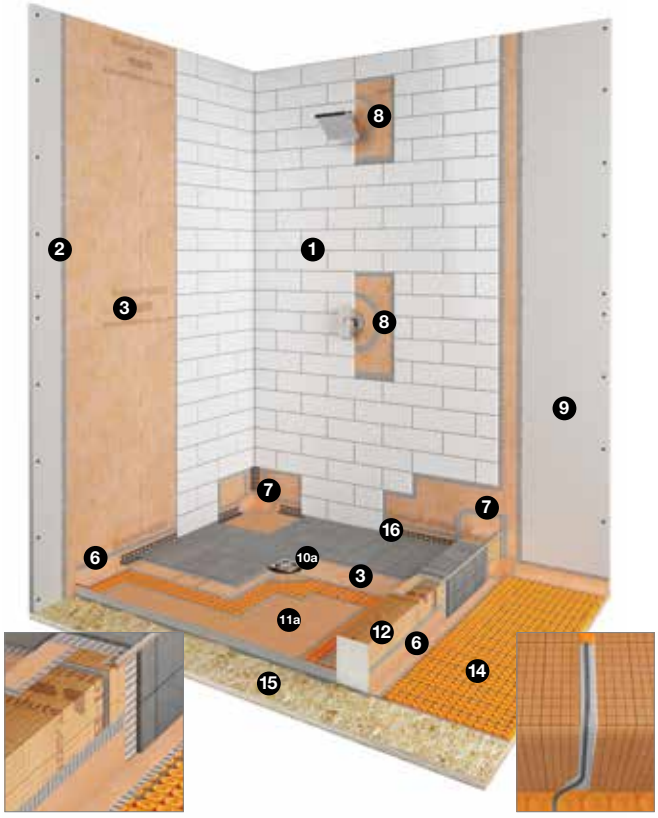
Other Considerations

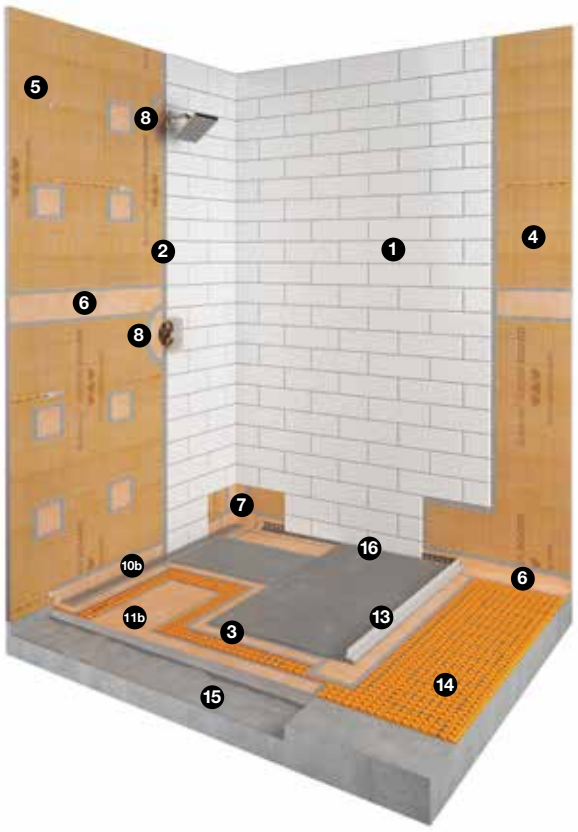
- seaming DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS, including floor/wall connections, with KERDI-BAND may be appropriate in cases where a break in the water line of an ice maker or dishwasher can damage pre-existing moisture-sensitive substrates and underlayments. KERDI-BAND floor/wall connections are just as easily concealed with wood base as with tile. KERDI-BAND floor/wall connections in dishwasher alcoves are parged with thin-set mortar.
- DITRA-HEAT-PS and DITRA-HEAT-DUO-PS membranes are waterproof when joints are properly sealed with KERDI-BAND, therefore peel-and-stick membranes are suitable for use in a bathroom/wet room if meeting specifications ANSI A118.10 is not required.
- in some applications, the vertical section of the floor/wall transition will not accept a bond to unmodified thin-set mortar. Connections to such elements can be achieved using KERDI-FIX or suitable trowel-applied waterproofing materials, such as those that require atmospheric moisture to cure (e.g., urethane sealant).
- KERDI-DRAIN-F may be used to provide drainage in DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS applications. DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS are sealed to the KERDI waterproofing collar on KERDI-DRAIN-F using Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar.

Showers – Ceramic or stone tile

Schluter®-DITRA-HEAT Shower Application

DH-SH





1. Ceramic or stone tile
2. Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET® or unmodified thin-set mortar
3. Schluter®-KERDI waterproofing membrane
4. Schluter®-KERDI-BOARD waterproof building panel
5. Schluter®-KERDI-BOARD-ZT/-ZS washers and screws
6. Schluter®-KERDI-BAND waterproofing strips
7. Schluter®-KERDI-KERECK-F waterproofing corners
8. Schluter®-KERDI-SEAL-PS/-MV seals or Schluter®-KERDI-FIX sealant and bonding compound
9. Solid backing
10. Drain:
    a. Schluter®-KERDI-DRAIN
    b. Schluter®-KERDI-LINE

    Alternative (not shown):
    • Schluter®-KERDI-LINE-VARIO
11. Base:
    a. Schluter®-KERDI-SHOWER-T/-TS/-TT
    b. Schluter®-KERDI-SHOWER-LT/-LTS

    Alternative (not shown):
    • Mortar bed
12. Schluter®-KERDI-BOARD-SC curb

    Alternatives (not shown):
    • Schluter®-KERDI-BOARD waterproof building panel
    • Built-up curb
13. Schluter®-SHOWERPROFILE-WSK/-WSL Shower profile

    Alternative (not shown):
    • Schluter®-SHOWERPROFILE-WS/-WSC
14. Schluter®-DITRA-HEAT/-PS or Schluter®-DITRA-HEAT-DUO/-PS Electric floor warming and uncoupling membrane

    Alternative (not shown):
    • Schluter®-DITRA/-PS or DITRA-XL uncoupling membrane
15. Wood or concrete subfloor
16. Schluter®-DILEX profile (optional)

    Bench (not shown, optional):
    Schluter®-KERDI-BOARD-SB
    Schluter®-KERDI-BOARD

    Niche (not shown, optional):
    • Schluter®-KERDI-BOARD-SN
    • Schluter®-KERDI-BOARD-SNLT

    Shelf (not shown, optional):
    • Schluter®-SHELF-E/-W/-N

DITRA-HEAT system installation in a shower requires KERDI membrane be installed on top. The Schluter-Shower System and KERDI family of products have been tested and are listed and approved as a fully waterproof system. Installation of KERDI over DITRA-HEAT in a shower ensures a dry environment for the heating cable. The KERDI membrane was evaluated and is certified waterproof by ICC-ES (Report ESR-2467). The Schluter-Shower System was evaluated and is certified waterproof by ICC-ES (Report PMG-1204).

Schluter®-DITRA-HEAT Shower Application

DH-SH

Note: Please refer to the Schluter-Shower System Installation Handbook for installation instructions and warranty criteria for the Schluter-Shower System.

Areas of Application

- Interior showers with or without curbless applications.
- Interior intermittent use steam showers (e.g., residential applications). See detail K-SSH in the Schluter-Shower System Installation Handbook for more information.
- Over wood or concrete subfloors. See the Base information under Requirements (below) for details.

Limitations

- Certain glass tiles may not be compatible with bonded waterproof membranes and/or may require special setting materials. Consult glass tile manufacturer and Schluter-Systems for more information.
- Certain moisture sensitive stones, e.g., green marble, or resin-backed tiles may not be appropriate for use in wet areas such as showers or may require special setting materials. Consult stone supplier and Schluter-Systems for more information.
- Do not use sawn lumber curbs on concrete subfloors subject to moisture migration.
- KERDI-BOARD not for use in exterior applications.
- DITRA-HEAT-PS and DITRA-HEAT-DUO-PS are not to be installed on top of a mortar bed.

Requirements

- Plywood, OSB, or concrete subfloor must be clean, even, and load bearing.
- For wood substrates, subfloor/underlayment configuration according to detail DH-W16-T, DH-W19-T, DH-W24-T, or DH-W-S.
- For curbless applications: Recessing the floor of a bathroom must be done in a way that preserves the structural integrity and safety of the construction. This may require the services of a qualified design professional (e.g., architect, engineer, etc.).
- Solid backing – gypsum wallboard, cementitious backer unit, fiber-cement backerboard, fiber-reinforced water-resistant gypsum backerboard, coated glass mat water-resistant gypsum backerboard, Portland cement mortar, concrete, or masonry.
- Minimum KERDI-BOARD thickness – 1/2" *(12.5 mm)* for studs spaced at 16" *(40.6 cm)* o.c. and 3/4" *(19 mm)* for studs spaced at 24" *(61.0 cm)* o.c.
- KERDI-BOARD shall be fastened to wood or metal framing with appropriate screws (i.e., KERDI-BOARD-ZS or coarse thread wood screw for wood studs and self-tapping for metal studs) and corresponding KERDI-BOARD-ZT washers. Screws must reach a depth of at least 3/4" *(20 mm)* in wood studs and 3/8" *(10 mm)* in metal studs. Maximum allowable on-center fastener spacing is 12" *(30 cm)* for walls and 6" *(15 cm)* for ceilings.
- KERDI or KERDI-BOARD shall be installed up to the height of the showerhead at minimum.
- Any protrusions through the KERDI or KERDI-BOARD (e.g., showerhead, mixing valve, etc.) must be treated with KERDI-SEAL-PS/-MV seals, KERDI-FIX or suitable sealant.
- Base – KERDI-SHOWER-T/-TS/-TT/-LT/-LTS or Portland cement mortar bed.
- Ramp – KERDI-SHOWER-R or Portland cement mortar bed.
- Curb – KERDI-BOARD-SC, KERDI-BOARD, concrete, masonry block, or sawn lumber sheathed with solid backing (see above).
- Bench – KERDI-BOARD-SB, KERDI-BOARD, concrete, masonry block, or sawn lumber sheathed with solid backing (see above).
- All horizontal surfaces (e.g., benches, curbs, window sills, shelves, etc.) must be sloped toward the shower drain.
- KERDI-DRAIN or KERDI-LINE/-VARIO shall be properly supported. Additional thin-set mortar may be needed to bed the KERDI-DRAIN for this detail.
- KERDI-DRAIN or KERDI-LINE/-VARIO shall be connected to the waste line; use ABS cement for ABS drains, PVC cement for PVC drains, a no-hub coupling for stainless steel drains with no-hub outlets, and thread sealing compound or tape for stainless steel drains with threaded outlets.
- When using the stainless steel KERDI-DRAIN bonding flange, use KERDI-FIX to bond KERDI to the drain.
- DITRA-HEAT heating cables must be installed in the DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS membrane. KERDI must be installed over the heating cables and DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS in the shower.
- Due to the installation of the DITRA-HEAT membrane on top of the shower tray, it is necessary to raise the height of the KERDI-DRAIN or KERDI-LINE/-VARIO. Installation of DITRA-HEAT membrane on the substrate under the detachable center section for KERDI-DRAIN or under the KERDI-LINE channel body support will provide the proper height adjustment.
- When a curb is used, the heating cables must be installed over the curb in a 3/4" wide x 1/4" deep routed section and encased in thin-set mortar. **DO NOT install the heating cable under the curb or go through the curb, as this could cause damage to the heating cable and curb. After the heating cable is installed, apply KERDI over the routed section of the KERDI-BOARD-SC curb or over the entire built-up curb.**
- A dedicated heating cable is recommended in the shower area to allow for simple disconnection without an impact on the bathroom floor heating in the event that the shower heating cable is damaged and unable to be repaired. Multiple heating cables may be installed on a single thermostat, up to the 15 amp limit. However, for ease of installation, a maximum of two heating cables per thermostat and a deep junction box is recommended. Refer to electrical codes for proper junction box selection for your installation.
- The minimum spacing from the edge of any drain pipe must be 4" *(100 mm).* With a linear drain, the cable must be 4" *(100 mm)* from the actual drain pipe and a minimum of 1" *(25 mm)* from the channel body edges.
- Heating cables must be spaced a minimum of 8" *(200 mm)* from steam inlets in intermittent use steam showers and continuous use steam rooms.

Safety

- Extra care must be taken for repairs to the DITRA-HEAT heating cable in wet areas. After repairs and waterproofing connections are completed, Schluter-Systems recommends flood testing the shower before re-tiling.
- Heating cable factory cold lead splice must not be installed in the shower area.
- For product certification information see Testing and Certification section on pages 29-30.

Substrate Preparation

- Verify that subfloor panels and solid backing are properly fastened to framing members.
- Any leveling of the subfloor must be done prior to installing KERDI-SHOWER-T/-TS/-TT/-LT/-LTS/-R, KERDI-BOARD-SC/-SB, DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS membranes.
- For optimal performance with difficult-to-bond-to substrates, use PRIMER-U or other primer suitable for the application. Contact Schluter-Systems to determine if PRIMER-U, or suitable primer, is required for the specific installation.

Solid Backing Materials

- Gypsum wallboard – ASTM C1396/C1396M
- Cementitious backer unit – ANSI A118.9 or ASTM C1325
- Fiber-cement backerboard – ASTM C1288
- Fiber-reinforced water-resistant gypsum backerboard – ASTM C1278
- Coated glass mat water-resistant gypsum backerboard – ASTM C1178
- Portland cement mortar – ANSI A108.1B
- Concrete
- Masonry

Setting and Grouting Materials

- Unmodified thin-set mortar – ANSI A118.1
- Grout – ANSI A118.3, A118.6, A118.7

Installation Specifications

- Solid backing panels – follow manufacturer's instructions
- Portland cement mortar bed – ANSI A108.1B
- Tile – ANSI A108.5
- Grout – ANSI A108.6, A108.10

Other Considerations

- **Acceptance of electric floor warming in a shower and this detail must be verified by the local inspector or authority having jurisdiction (AHJ).**
- KERDI is required on top of DITRA-HEAT installations in the shower. Schluter-Systems chooses to be conservative and to ensure everything is protected. Note: DITRA-HEAT-E-HK heating cables are rated for wet applications per CAN/CSA-C22.2 No.130-16. DITRA-HEAT and DITRA-HEAT-DUO membranes have been found to meet or exceed requirements of ANSI A118.10. DITRA-HEAT-PS and DITRA-HEAT-DUO-PS do not meet or exceed requirements of ANSI A118.10. If meeting ANSI A118.10 specifications is required and peel-and-stick membranes are to be used, the entire area must be covered with KERDI membrane in conjunction with appropriate KERDI components.
- Curbless tiled showers rely on the slope of the floor to effectively contain water in the immediate shower area and direct water to the drain. Given the wide range of potential configurations, it isn't possible to address them all in this Handbook.
- For curbless applications: waterproofing must be installed in all areas subject to water exposure.
- SHOWERPROFILE-WS/-WSK system profiles can be used to form a splashguard at the entrance of curbless showers.
- Various building codes and other sources, such as the Americans with Disabilities Act, include specific requirements for disabled access in public buildings and must be consulted when applicable. Areas of interest may include degree of slope, clearance, and supporting structures such as grab bars.
- Shower grab bars must be anchored in the structure or solid blocking behind KERDI-BOARD.
- When KERDI-SHOWER-T/-TS/-TT/-LT/-LTS tray dimensions do not match the dimensions of the shower compartment, the tray may be cut or extended with dry pack mortar.
- When KERDI or KERDI-BOARD and tile are installed on the ceiling, the solid backing and fasteners must be able to support the load of the tile and setting and grouting materials.
- A water test is recommended before setting tile to verify a successful installation. Wait 24 hours minimum after the membrane installation is complete to allow for final set of thin-set mortar and ensure waterproof performance at seams and connections. For curbless showers a temporary dam (e.g., a 2x4 and silicone sealant, plastic sheeting and sand, etc.) must be provided at the threshold to perform the water test.
- Schluter-Systems profiles may be used to finish and protect outside corners and eliminate the use of sealant at inside corners.
- SHOWERPROFILE-S/-R profiles eliminate the need for cutting wedges of tile by covering the exposed wall area where the floor slopes to KERDI-LINE/-VARIO.
- SHELF-E/-W/-N are alternatives to tiled shelves that can be easily installed on walls and in corners and niches; see Shower System Installation Handbook.
- Where a waterproof floor adjacent to the shower is desired, DITRA/-PS or DITRA-XL uncoupling membrane, DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS electric floor warming and uncoupling membrane shall be installed. Floor/wall connections shall be sealed with KERDI-BAND.

MOVEMENT JOINTS

Every substrate presents unique challenges

DISCUSSION

Movement joints are an integral part of any tile assembly. The various components of a tile assembly (tile, mortar, substrate, etc.) have unique physical characteristics that affect their behavior. Specifically, these components will expand and contract at different rates, according to each component's intrinsic physical properties, with changes in moisture, temperature, and loading (both dead and live loads). This differential expansion/contraction of attached components results in internal stresses. Furthermore, structures that restrain overall expansion of the tile field (walls, columns, etc.) cause stress buildup within the system. If the aforementioned movements are not accommodated through the use of movement joints in the tile field and at restraining structures, the resulting stresses can cause cracking of the grout and tile and delamination of the tile from the substrate. Thus, movement joints are an essential component of any durable tile assembly.

SOLUTIONS

Movement joints must be incorporated within the tile field, at doorsills, and at transitions to walls and other restraining structures to allow movement of the assembly and prevent stresses that can damage the system. Schluter-Systems' prefabricated movement joint profiles protect tile edges and prevent sound bridges and surface water penetration, resulting in a permanent, maintenance-free installation. The family of **Schluter®-DILEX** prefabricated movement profiles includes a variety of shapes, sizes, and materials to suit different applications. Please see Schluter-Systems' Illustrated Price List and visit www.schluter.com for more detailed information on DILEX movement profiles.

TECHNICAL NOTES

The Tile Council of North America (TCNA) and the Terrazzo, Tile, and Marble Association of Canada (TTMAC) provide guidelines (EJ171 and 301MJ, respectively) for the placement and construction of movement joints in and around the tile field. Schluter-Systems accepts these guidelines. However, given the increased use of larger tiles, smaller grout joints, and lighter building materials, which are more susceptible to movement, Schluter-Systems recommends that movement joints within the tile field be placed at more frequent intervals, as indicated below.

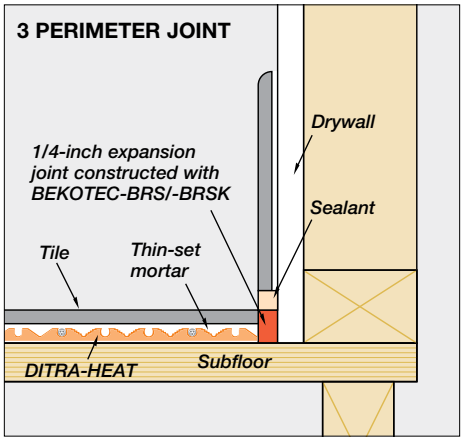
Guidelines for the placement of movement joints

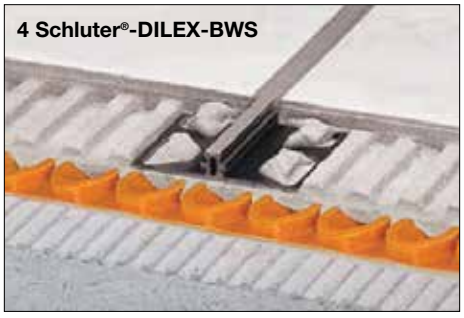
- Field size not to exceed 400 ft^2 *(37.0 m^2)*
- Applications without heating cables: 16' - 20' *(4.9 m - 6.1 m)* in each direction
- Applications with heating cables or exposed to direct sunlight or moisture: 12' (*3.7 m*) in each direction
- Place around the perimeter of any size floor and/or against all restraining surfaces
- Fields should be as square as possible. The ratio between length and width should not exceed 1:1.5

Typical movement joint applications

1 Schluter®-DILEX-EKE

2 Schluter®-BEKOTEC-BRS/-BRSK





4 Schluter®-DILEX-BWS

Perimeter Joints

Perimeter joints are provided at the outer edges of any tile installation to accommodate movements attributable to changes in moisture, temperature, and loading. See figures 1, 2, and 3.

If DILEX corner movement profiles will not be used, Schluter-Systems recommends the use of BEKOTEC-BRS/-BRSK edge strip or sill seal (a compressible polyethylene gasket used to seal the gap between foundations and sill plates) as a quality control measure when providing perimeter movement joints. The edge strip/sill seal band is placed against perimeter structures before any component of the tile assembly is installed, (e.g., DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS, additional underlayments including self-leveling materials, mortar beds, etc. See figures 2 and 3). After the tile is installed and grouted, any excess edge strip/sill seal material is cut away, leaving a movement joint with uniform width that is void of any mortar, grout, or other restraining materials that would render the joint ineffectual.

Surface Joints

Surface joints must be placed within the tiled surface regardless of substrate conditions. They provide for stress relief from movements in the tile field due to thermal and moisture expansion/contraction and loading. See figure 4.

Expansion Joints

Expansion joints permit both horizontal and vertical differential movements attributable to thermal and moisture expansion/contraction by providing a complete separation for the full depth of the slab to allow for free movement between adjoining parts of a structure or abutting surfaces. They are typically placed at columns, walls, and any other restraining surfaces. Expansion joints must be continued through the tile covering. The DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS membranes are separated at expansion joints and the joint is continued through the tile covering using DILEX movement joint profiles. The DITRA-HEAT-E-HK heating cables must not cross expansion joints. When DITRA-HEAT membranes are used as waterproofing, the abutted sections must be covered with KERDI-FLEX or KERDI-BAND.

Cold Joints

Cold (construction) joints occur where two successive placements of concrete meet. True cold joints bond the new concrete to the old and do not allow movement. However, it takes extra care to accomplish this, so they are usually designed to act as expansion or control/contraction joints. Cold joints are treated in the same manner as expansion joints. See above.

Control/Contraction Joints

Control/contraction joints are designed to induce controlled cracking caused by drying and chemical shrinkage at preselected locations. They are typically formed by saw cutting, tooling, or through the use of inserts. DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS are not separated at control/contraction joints; however, surface movement joints must be provided in the tile covering in accordance with the aforementioned guidelines. See also Surface Joints.
Soft joints are not required directly above concrete slab when using DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS membrane.

Structural or Seismic Joints

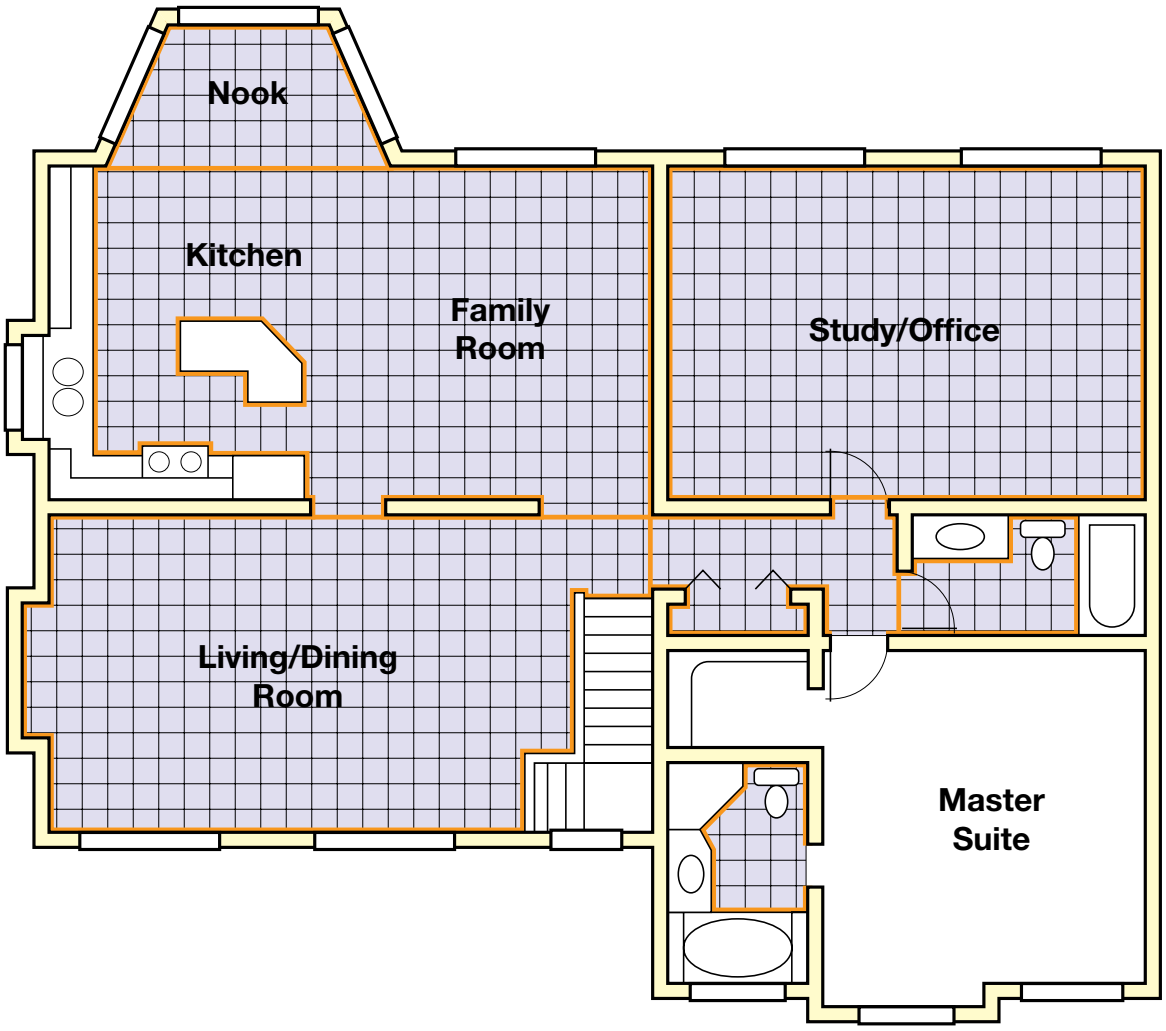
Regarding structural and seismic expansion joints, please contact Schluter-Systems at 1-800-472-4588 (USA) or 1-800-667-8746 (Canada) for proper installation guidelines.

Note regarding residential applications

Due to the increased popularity of continuous tile installations (i.e., tile continuing from room to room on a given floor), movement joints have become both increasingly important and increasingly difficult to provide. For instance, consider the residential installation shown in Figure 5. It is almost certain that the homeowner will resist the idea of placing movement joints across any of the rooms shown in the figure, despite TCNA, TTMAC, and Schluter-Systems guidelines. However, the need for movement joints in this installation is undeniable, given the extended size of the field. The question then becomes, "How does one provide the movement joints necessary to ensure a durable installation without compromising the aesthetic qualities of the continuous tile field?"

The easiest way to accomplish this goal is to begin by providing movement joints at the perimeter of the installation. Perimeter joints are absolutely necessary and do not interrupt the tile field. The next step would be to place movement joints at the thresholds between rooms or where a tiled hallway meets a larger tiled room. These locations are relatively inconspicuous and the lines formed by the movement joints are logical in that they reflect the natural perimeter of each room. Finally, determine if any other characteristics of the floor plan invite the placement of additional movement joints. In this example, the intersection of the nook area and kitchen/family room may be a reasonable choice.

Figure 5



Schluter-Systems understands that the tile setter must take into account the needs of his or her client in determining the placement of movement joints in a tile installation. For example, a client may not wish to interrupt a continuous tile field that spans multiple rooms. However, as indicated by the orange lines above, there are ways to meet industry guidelines that will serve to provide the client with a durable installation that remains aesthetically pleasing.

WOOD UNDERLAYMENT

Plywood/OSB underlayment installation guidelines

DISCUSSION

In some applications referenced in this Handbook, adding a layer of plywood or OSB before installing DITRA-HEAT and the ceramic or stone tile covering is required to reduce deflection and curvature of the sheathing between the joists.

INSTALLATION GUIDE

Place underlayment panels (Exposure 1, plugged-face plywood or OSB) with long dimension perpendicular to floor joists such that the following conditions are met:

1. Abut all underlayment end joints at quarter points between joists.

Example: Abut underlayment panels on either side of the joist centerline at: 4" *(102 mm)* for 16" *(406 mm)* o.c. joists, 5" *(127 mm)* for 19.2" *(488 mm)* o.c. joists, or 6" *(152 mm)* for 24" *(610 mm)* o.c. joists (see figures 1 & 2).

Note: Underlayment end joints should be placed as far away from subfloor end joints as possible.

2. Underlayment to overlap edge joints of subfloor by 1/2 of the width of the subfloor panel (24" - *610 mm*). At restraining surfaces, overlap may be less than 24" *(610 mm)* when the subfloor panel is less than 48" *(1.2 m)*-wide (see figure 1).

3. Gap underlayment panels 1/8" *(3 mm)* on all ends and edges, and 1/4" *(6 mm)* at perimeter walls, cabinetry, or other restraining surfaces.

Figures 1 & 2 – Typical Subfloor/Underlayment Detail (Not to Scale)

Figure 1

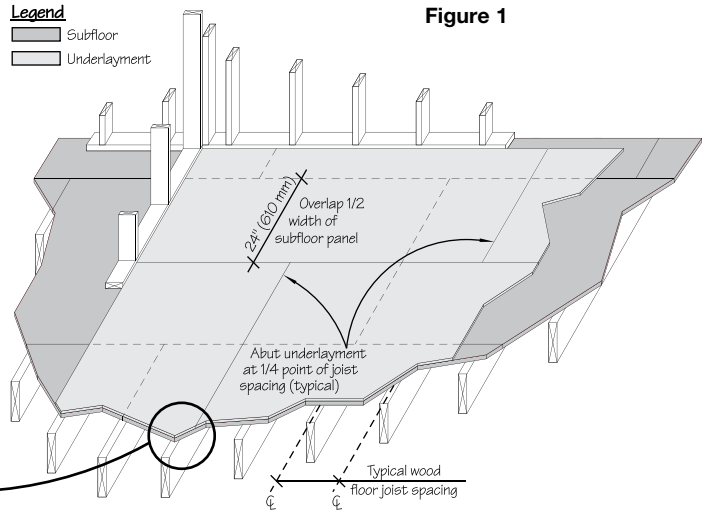
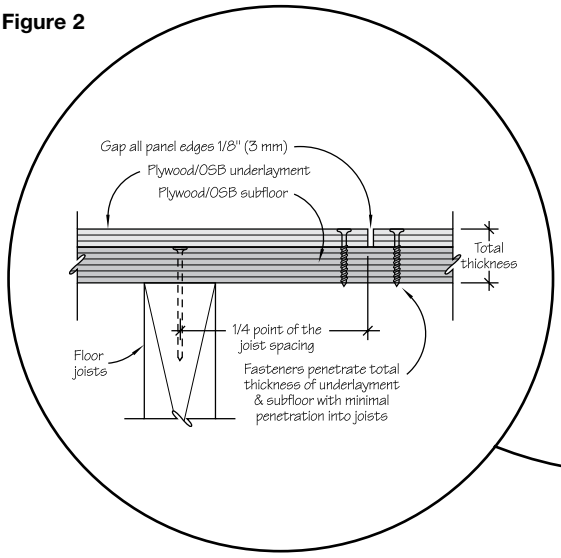


Figure 2



Plywood/OSB Type and Fastener Schedule Guidelines			
Plywood/OSB Grades	Plywood/OSB Thickness - in *(mm)*	Maximum On-Center Fastener Spacing - in *(mm)*	
		Panel Edges	Field
Exposure 1, plugged-face plywood or OSB	3/8 *(10)*	4 *(102)*	6 *(152)*
	1/2 *(13)*	4 *(102)*	6 *(152)*
	Greater than 1/2 *(13)*	6 *(152)*	6 *(152)*

The following guidelines must be followed when fastening underlayment panels:

1. Use ring shank nails (no staples) or wood screws (no drywall screws).

2. Fasteners must pass through entire thickness of underlayment and subfloor panels with minimal penetration into joists (see figure 2).

FINAL WORD

As stated previously, Schluter-Systems requires that any underlayment panel must have a minimum thickness of 3/8" *(10 mm)*. When in doubt, increase underlayment thickness.

ALTERNATIVE FLOOR COVERINGS

Engineered wood, vinyl, linoleum, WPC/LVT/LVP, SPC tile/plank, and laminate flooring over Schluter®-DITRA-HEAT

This section summarizes the requirements, limitations, and general installation guidelines for installing alternative floor coverings over DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS membranes and DITRA-HEAT-E-HK heating cables. It also explains the limitations of these flooring materials when used over a floor warming substrate compared to ceramic and stone tile. Please use this section in conjunction with the other sections of the DITRA-HEAT Installation Handbook to help ensure a successful installation. Table 1 below lists the various types of alternative floor coverings tested.

The DITRA-HEAT system was designed for use with ceramic, porcelain, and stone tile coverings. It is important to note the alternative flooring materials have heat conductivities which are on average 10 times lower than those for ceramic, porcelain and stone. Also, not all brands and products that fall into the alternative floor coverings types listed in Table 1 are compatible with radiant floor warming.**It is essential to read the floor covering data sheet, or installation instructions, or to verify directly with the manufacturer that the chosen floor covering is compatible with radiant floor warming and that the temperature limit is at minimum 85°F *(29.5°C)*.**

Table 1: Expected Flooring Surface Temperatures and Thickness Requirements for Self-Leveling Underlayment

Floor Covering			Self-Leveler Min. Thickness Over DITRA-HEAT Membrane Studs		Expected Average Surface Temperature[1, 2, 3]	
Type	Thickness					
	(in)	(mm)	(in)	(mm)	(°F)	(°C)
SPC (Vinyl-Based LVT/LVP & Non Vinyl-Based Tile & Plank)*	1/8 – 9/32	3 – 7	0.25	6	80.5 – 79	27 – 26
Vinyl/linoleum/WPC/LVT/LVP	1/16 – 5/16	1.5 – 8	0.25	6	80 – 77	26.5 – 25
Engineered Wood (Adhered)	3/8 – 9/16 5/8 – 3/4	10 – 15 16 – 19	0.25 0.31	6 8	77 – 76 75	25 – 24.5 24
Laminate & Engineered Wood (Floating)[4]	9/32 – 19/32	7 – 15	0.25	6	77 – 76	25 – 24.5
Ceramic, Porcelain, and Stone Tile	1/4 – 1/2	6 – 12.5	N/A	N/A	82	28

Notes

1. The temperature values reported above are based on laboratory testing; they can serve as estimates of performance in the field, but cannot predict project-specific results.

2. Surface temperatures will vary with room temperature; those reported above are based on a thermostat set point of 82°F *(28°C)* and room temperature of 72°F *(22°C)*.

3. Surface temperature ranges are reported because results will vary based on floor covering thickness and installation method.

4. For floating laminate flooring and engineered wood, the foam pad or mat used was 3/32" *(2.4 mm)* in thickness. Expected flooring surface temperatures will be lower with thicker foam pads or mats.

* Most SPC flooring materials withstand higher sub-floor temperatures than 85°F *(29.5°C)*, please consult with manufacturer's data sheet or installation instructions to determine how high your choice can be set.

REQUIREMENTS AND LIMITATIONS

DITRA-HEAT is suitable for applications with engineered wood, vinyl, linoleum, wood plastic composite (WPC), luxury vinyl tiles (LVT), luxury vinyl planks (LVP), stone plastic composite (SPC) tiles and planks, and laminate flooring, subject to the following requirements and limitations:

- Verify with the floor covering manufacturer that the **selected product is suitable for radiant floor warming applications and that it can withstand a temperature of 85°F *(29.5°C)* at minimum.**
- If floor covering to be used in a wet area, verify with the floor covering manufacturer that the selected product is suitable.
- The floor covering, including any foam/rubber pad or mat must not exceed a **thermal insulation value of R1 (Rsi of 0.18).** All floor coverings listed in Table 1 have a R-value below 1.
- **Carpets** are generally not recommended, but if installed, they must not exceed a R-value of 1, including any rubber pad or mat used.
- Any floor covering adhesive must be recommended by the manufacturer, suitable for use over a cementitious substrate, and compatible with radiant floor warming.
- **A cementitious self-leveling underlayment is used to fill the membrane and encapsulate the heating cables.** Verify with the underlayment manufacturer that it is suitable for the application. The underlayment is applied to a level above the studs in the membrane as specified in Table 1, according to the type and thickness of the floor covering. The underlayment should be applied in a single pour.
- Any **floor leveling** must be done prior to the DITRA-HEAT system installation. Thicker than necessary, or uneven thickness of self-leveling underlayment above the DITRA-HEAT system will affect performance.
- **The thermostat must be set at 82°F *(28°C)* or lower at all times.** All Schluter thermostats have a "Laminate" option within the settings. For steps on selecting the laminate option, please see the appropriate User Guide for your thermostat.
- If the floor covering is SPC type, the thermostat set point could be set higher, but verify the limit with the manufacturer's data sheet or installation instructions.
- **Solid hardwood** is not recommended in floor warming applications due to its thickness and risk of damage caused by excessive drying of the wood while exposed to heat.

Alternative Floor Coverings

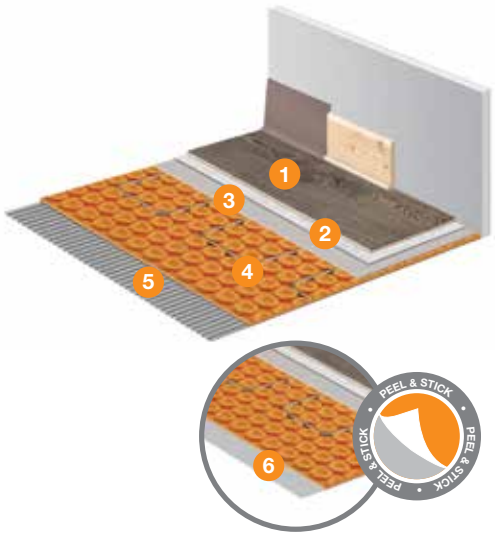
INSTALLATION

The following installation method has been developed and evaluated through a series of tests to ensure practicality and successful results. This information below is meant to provide the highlights of a typical installation.

1. Provide **perimeter joints** at the outer edges of the installation to accommodate movement due to changes in moisture, temperature, and loading. Sill seal (a polyethylene foam gasket) is an effective quality control measure to provide perimeter movement joints.
2. Install the DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS.
3. Test the DITRA-HEAT heating cable(s) prior to installation.
4. Embed the heating cables between studs at **continuously alternating 3-2 stud spacing. Exception:** a continuous 2 stud spacing is recommended when connecting a 240 V heating cable to a 208 V power supply. See page 35 for more information.
5. Install the tip of each floor temperature **sensor in the middle of a 2 stud cable spacing section**, instead of a 3 stud cable spacing section.
6. Retest the heating cable(s) to verify no damage occurred during the installation.
7. Fill the membrane and encapsulate the cables with a cementitious self-leveling underlayment. Apply the **underlayment** to a level according to Table 1.
8. Once the self-leveling underlayment has set, retest the heating cable(s) to verify no damage occurred during the installation.
9. Allow the self-leveling underlayment to cure according to the underlayment and floor covering manufacturers' instructions prior to the installation of the floor covering.
10. Install the floor covering according to the manufacturer's instructions.
11. Install the DITRA-HEAT-E thermostat in the electrical junction box, connecting it to the heating cable cold lead and to the electrical power supply.
12. **Start up** the floor warming after any waiting period required by the self-leveling underlayment and floor covering manufacturers.
13. **All Schluter thermostats have a "Laminate" option within the settings. For steps on selecting the laminate option, please see the appropriate User Guide for your thermostat.** The set point temperature of the thermostat must remain at 82°F (28°C) or below at all times, unless the floor covering is an SPC type. If an SPC type, verify with manufacturer's data sheet or installation instructions if the set point temperature can be raised to a higher level.

DH-AFC and DHPS-AFC

1. Engineered wood, vinyl, linoleum, WPC, LVT/LVP, SPC, and laminate
2. Floor covering adhesive or foam underlayment, if required, per manufacturer
3. Cementitious self-leveling underlayment
4. **DITRA-HEAT/-PS** or **DITRA-HEAT-DUO/-PS** uncoupling membrane and heating cables
5. Thin-set mortar per appropriate detail
6. **PRIMER-U/-PS** per appropriate detail



Floors, Interior - Engineered Wood, Vinyl, Linoleum, WPC, LVT/LVP, SPC tile/plank, and Laminate

Areas of Application
- over any even and structurally sound substrate
- interior dry or wet areas (verify suitability of floor covering material for wet areas)

Limitations
- DITRA-HEAT-DUO/-PS not recommended over hydronic heated floors
- withstand temperature for floor covering: 85°F (29.5°C) or greater
- maximum thermostat set point 82°F (28°C) in service, unless floor covering is SPC type and can withstand a higher temperature
- maximum thermal insulation of floor covering R1
- moisture-sensitive floor coverings not recommended for wet areas

Requirements
- floor covering must be recommended for the application by the manufacturer
- DITRA-HEAT-E-HK heating cables spaced at continuously alternating 3-2 stud pattern
- floor temperature sensors must be placed between heating cables spaced at 2 studs
- minimum self-leveling underlayment elevation over studs 1/4" *(6 mm)* or 5/16" *(8 mm)*, as per Table 1

Substrate Preparation
- in accordance with applicable DITRA-HEAT Installation Handbook detail and floor covering manufacturer's directions
- any leveling of the subfloor must be done prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS

Movement Joints
- DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS do not eliminate the need for movement joints, including perimeter joints. Movement joints must be installed in accordance with industry standards and floor covering manufacturer's directions

Setting Materials
- unmodified thin-set mortar – ANSI A118.1
- modified thin-set mortar – ANSI A118.11
- cementitious self-leveling underlayment – recommended by SLU manufacturer

Installation Specifications
- cementitious self-leveling underlayment – ASTM F2873 and manufacturer's directions
- floor covering – follow manufacturer's directions

Other Considerations
- alternative floor coverings have lower thermal conductivity than ceramic and stone tile and surface temperatures will be lower in these applications at the same thermostat set point; this effect is magnified as the alternative floor covering thickness is increased
- where a waterproof floor is required, all DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar; see DH-WP in the DITRA-HEAT Installation Handbook
- vapor barrier on crawl space floors according to regional building codes

Warnings and Planning

GENERAL DETAILS

- **Before installing and operating this product, the user and/or installer must read, understand, and follow these instructions and keep them handy for future reference. If you have a question, please contact Customer Service by phone 800-472-4588 (USA) or 800-667-8746 (Canada) or from our website at www.schluter.com.**

If this installation handbook and these instructions are not followed, the warranty will be considered null and void and the manufacturer deems no further responsibility for this product.

The following instructions must be adhered to in order to avoid personal injuries or property damages, including serious injuries and potentially fatal electric shocks or fire.

This product must be installed by a qualified person in accordance with this installation handbook and with the Canadian Electrical Code Part I (Canada) or the National Electrical Code (U.S.) as applicable. All electric connections must be made by a qualified person, according to the electrical and building codes effective in your region.

ELECTRICAL DETAILS

NEVER install a cable designed for a 120 V power source on a 240/208 V power source.

- A dedicated circuit is recommended for each application, but a circuit supplying one or more fixed room heaters may be used, as long as its rating does not exceed 30 amperes, that the total current from all branch circuits does not exceed 80% of the circuit breaker limit, and the branch circuit cable reaching the thermostat junction box is of the same conductor size as the main circuit.

De-energize all power circuits before installation and servicing.

- A thermostat control device (i.e., thermostat or power module) is required for each heating cable system installation.
- A Class A (5 mA) ground fault circuit interrupter (GFCI) is required for each circuit. The Schluter®-DITRA-HEAT-E thermostats and power modules include a GFCI, thus a GFCI circuit breaker is not required when using these thermostats. In Canada, verify placement of thermostat and use of GFCI protected circuit breakers with the local inspector, authority having jurisdiction (AHJ), or other qualified person.
- In Canada, according to Rule 62-202 of the Canadian Electrical Code 2021, a thermostat or an applicable temperature control device is required for each enclosed area where a heating cable is installed. A heating cable is permitted to extend into adjacent rooms and be controlled by a single temperature control device or thermostat.
- As necessary, please verify your installation plan with local inspector to determine their interpretation of the rule and whether or not your cable layout is approved prior to setting tile.
- In the USA, according to Rule 424.38 (A) of the National Electrical Code 2020, heating cables may extend beyond the room in which they originate. In previous editions of the National Electrical Code (NEC), extending heating cables beyond the room was not permitted. Please verify with your local inspector to determine which edition of the NEC is being enforced by the local Authority Having Jurisdiction (AHJ).
- Additionally, installations of heating cables in dressing rooms or large walk-in closets are subject to approval by the local AHJ.
- Mark the circuit breaker in the electrical panel that is connected to the DITRA-HEAT floor warming system using the identification sticker provided. Additional stickers provided may be placed on the electrical panel door.
- Connecting a DITRA-HEAT-E thermostat or DITRA-HEAT-E-RR/-RRS power module to an AFCI circuit breaker may cause the unit to trip for other than safety reasons.
- The heating cable ground braid must be bonded to ground.
- Threading the cold lead from the floor to the thermostat junction box needs to be done within an approved raceway or conduit. The conduit is required to begin at no greater than 2 inches (50 mm) from the floor. The opening in the horizontal stud at the base of the wall, which provides access for the cold lead to the inside of the wall, shall be covered by a steel plate to protect the cold lead from any possible future damages from nails or screws.
- The floor temperature sensors need to be threaded either inside the same conduit as the cold lead, or in a separate conduit.

SPACING DETAILS

- It is helpful to plan the location of a buffer zone, as it is not possible to predict where the heating cable will end. The buffer zone is an area where heating is not essential and heating cable installation is not planned (e.g., behind a toilet or adjacent to a door opening). This area allows for placement of excess heating cable. Heating cables may also be installed 6" *(150 mm)* from the wall to create a buffer zone.
- Cable spacing shall be limited to a repeating 3 stud (3.6" or *9.1 cm*) spacing, or a continuously alternating 3 stud (3.6" or *9.1 cm*) and 2 stud (2.4" or *6.1 cm*) spacing (i.e.: 3-2-3-2-3-2 and so on) between cable runs. A repeating 2 stud spacing or narrower spacing shall not be used as it may cause overheating and cable malfunction. A wider spacing (e.g., 4 studs or more) may not provide sufficient power to warm the floor to the desired temperature and may cause inconsistent floor surface temperatures. Installer should discuss heating cable spacing with the homeowner before proceeding with the cable installation. Exception: a continuous 2 stud spacing is recommended when connecting a 240 V heating cable to a 208 V power supply. See page 35 for more information.

Minimum spacing requirements from:		
Fixed elements	Distance	
	in.	mm
Walls, partitions, and fixed cabinets*	2	50
Edge of plumbing drains	4	100
Forced air heating vents	4	100
Heat sources (baseboard heaters, fireplaces, etc.)	8	200
Centerline of toilet drains	7	180
Linear drain (channel body edges)	1	25

* From toe-kick recess

- For alternate floor coverings (other than ceramic, porcelain, and stone tiles), please refer to the section entitled, "Alternate Floor Coverings" on page 18 for cable spacing details.
- Minimum spacing from walls, partitions, and fixed cabinets is 2" *(50 mm)*.
- Minimum spacing from other heat sources (baseboard heaters and other fixed heating devices, fireplaces, etc.) is 8" *(200 mm).*
- Minimum spacing from any forced air heating vents is 4" *(100 mm)*.
- Minimum spacing from the centerline of a toilet drain is 7" *(180 mm)*. **Note:** When installing a toilet and/or toilet flange, be aware of the bolt locations and use care to not damage the heating cable.
- The minimum spacing from the edge of any drain pipe must be 4" *(100 mm).* With a linear drain, the cable must be 4" *(100 mm)* from the actual drain pipe and a minimum of 1" *(25 mm)* from the channel body edges.

▲ NEVER install the heating cable under vanities with no air space beneath, bathtub platforms, free standing bathtubs with no air space beneath, kitchen cabinets and islands, appliances, or any other fixtures, or in small storage or clothing closets where various items may be kept on the floor. Excessive heat will build up in these confined spaces and may cause cable overheating.

▲ Do not run the heating section of the heating cable set under or through a wall, partition, or through a floor.

▲ Do not install the heating cable on a wall (e.g., shower wall, inside of a built-in bathtub, etc.).

▲ Heating cables may not touch, cross over, or overlap one another or itself.

- In North America, applying the DITRA-HEAT heating cable on a shower bench requires the prior approval of the inspector or your local authority having jurisdiction.
- Two floor temperature sensors must be installed within the tile assembly. Two floor temperature sensors are provided with the DITRA-HEAT-E-HK heating cables. Install the tip of each temperature sensor in the middle of the three stud spacing cable runs, no matter if the standard 3 stud cable spacing or the continuously alternating 3-2 stud cable spacing option has been used, unless an alternative floor covering will be installed (see page 18-19 for details). Connect only one to the thermostat and the other is a spare in case one is broken during overall installation.

INSTALLATION DETAILS

- Heating cable testing is required while the heating cable is on the spool and at two subsequent steps during installation to ensure cable quality and for warranty purposes.
- Visually check the heating cable, cold lead, factory cold lead splice, and end splice for any breaks or damage. If a break or damage is detected during the heating cable testing while the heating cable is on the spool, return the cable to the original place of purchase. Do not proceed with heating cable installation into the DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS matting or with the tile covering installation.

▲ NEVER energize the cable while it is on the spool. This would lead to overheating that could damage the cable.

▲ NEVER use the heating cable for any purpose other than for indoor floor warming as explained in this Handbook.

▲ Heating cables shall not be altered in the field. If the installer or the user modifies or accidentally damages the unit, they will be held responsible for any resulting damage, and the warranty and the product certification will be void.

▲ **NEVER cut or modify the heating cable in any way.** This would change the cable resistance, will cause damage to the cable, and could cause cable overheating.

- For installations requiring a cold lead trim or extension, the electrical rating label shall be fixed to the cold lead and visible at the termination junction box. Removing the electrical rating label permanently will void the warranty.
- The minimum temperature at which the cable should be installed is 32° F *(0° C)*.

▲ The heating section of the cable and the factory cold lead splice (i.e., black plastic junction between the cold lead and gray heating cable) must be entirely installed under the floor covering, and into a mortar or thin-set layer, as shown in the heating cable installation instructions. Do not install it in or on a wall, under a refrigerator, under baseboard molding, or anywhere else, as this may cause overheating and system failure.

- Avoid folding the heating cable on itself, a radius of curvature less than 1/16 inch *(1.6 mm)* could damage its sheath.
- The minimum installed bending radius of the heating cable is 0.5 inches *(12.7 mm)*.
- Never perform Insulation Resistance Test (Test 3) on floor temperature sensors. This will damage the sensor element.
- Floor temperature sensor testing is required before installation (See Test 4).
- The type and thickness of floor covering materials used with this product must not exceed a thermal insulation “R” value of 1. Example “R” Values: Ceramic/Mosaic Tile 0.25" thick = R0.15; Natural Stone 1" thick = R0.38-0.114; Porcelain Tile 0.25" thick = R0.024; Vinyl/LVT/LVP/WPC/SPC 0.25" thick = R0.4; Engineered Wood (glued) 0.5" thick = R0.25; Engineered Wood (floating) 0.5" thick + 1/8" padding = R0.5; Laminate Flooring 0.38" thick + 1/8" padding = R0.62.

OPERATING TIPS

- Do not place furniture or mats over the floor temperature sensor. They can act as insulation and raise the floor temperature reading at the thermostat. This may cause the heating to turn off before the remainder of the floor reaches the desired temperature.
- Area rugs are not recommended over the DITRA-HEAT system, but if used, they shall have an insulating R-value not greater than 1 (Rsi not greater than 0.18). The area rugs shall not be located on top of where the floor temperature sensor is placed, as it will otherwise reduce the heat efficiency.
- Futons, mattresses, floor-level furniture, pillows, etc. must not be placed directly onto the heated floor. Placement of items directly onto the heated floor will prevent heat diffusion (i.e., air circulation) and could result in damage.

INSTALLATION

Schluter®-DITRA-HEAT membrane and heating cables

Planning

For access to the DITRA-HEAT Calculation Sheet and DITRA-HEAT Online Estimator, see www.schluter.com.

- Select DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS membrane according to the size of the area to be tiled.
- The maximum level of thermal insulation under the subfloor to which DITRA-HEAT can be installed is R20 (or Rsi 3.5).
- For the applicable heating cable spacing for your application, see the Spacing Details section in the Warnings section (pages 20-21).
- For buffer zone planning see the Warnings section (page 20-21) under Spacing Details.
- Select the DITRA-HEAT-E-HK heating cable according to the size of the area to be heated and applicable heating cable spacing for your application. When measuring the area to be heated, be sure to measure accurately. The heating cable CANNOT be cut to fit. See the Spacing Details section in the Warnings section (pages 20-21).
- Multiple DITRA-HEAT-E-HK heating cables can be connected and controlled by a single DITRA-HEAT-E thermostat, if the total current is less than 15 amps. The junction box must be sized according to the electrical code effective in your region, and must consider the possible use of pigtails and the space occupied by the back part of the thermostat.
- Multiple DITRA-HEAT-E-HK heating cables over 15 amps cannot be connected to a single DITRA-HEAT-E thermostat. Additional DITRA-HEAT-E thermostats must be used, or a DITRA-HEAT-E thermostat may be combined with the DITRA-HEAT-E-RR or DITRA-HEAT-E-RRS power modules, depending on the thermostat used.
- **Acceptance of electric floor warming in a shower and the DH-SH detail must be verified by the local inspector or authority having jurisdiction (AHJ).**

Substrate Preparation

- The substrate must be clean, even, and load bearing. Any leveling of the subfloor must be done prior to installing DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS.
- Clean any dust from the substrate with a damp sponge.
- For **peel-and-stick membranes**, in particular when installing DITRA-HEAT-DUO-PS, it is highly recommended to layout and cut the membrane sections with the release film intact. This will result in fewer mistakes requiring repositioning of the membrane with the pressure sensitive adhesive exposed.
- For **wood substrates,** verify that panels are properly fastened. Tightly butted and/or tented plywood or OSB seams must be addressed prior to installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS. If a plywood/OSB underlayment is to be installed, follow the Wood Underlayment guidelines on page 17.
- For **vinyl substrates**, ensure that the structure beneath is sound and adequate and that the vinyl is well adhered. Remove any wax and clean the surface. For vinyl over wood structures, nail off floor with ring shank flooring nails every 4" *(102 mm)* o.c. - fasteners must pass through entire thickness of assembly with minimal penetration into joists.
- For **concrete substrates**, remove any waxy or oily films and curing compounds (if present) by mechanical scarification. When bonding DITRA-HEAT and DITRA-HEAT-DUO to particularly dry, porous concrete, the slab should be moistened to saturate the concrete and help prevent premature drying or skinning of the bond coat. Excess or standing surface water must be removed prior to installation.
- For **gypsum substrates**, residual moisture in gypsum screed must be 2.0% or less before installing DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS. Follow gypsum manufacturer's directions for additional substrate preparation.
- For optimal performance with difficult to bond to substrates, use PRIMER-U/-PS or other primer suitable for the application.

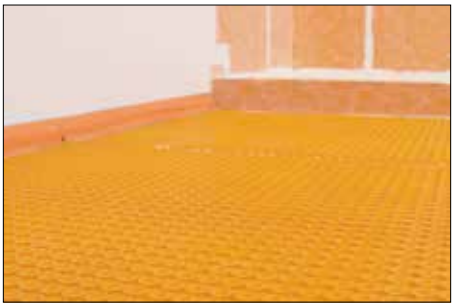
Membrane - Thin-set Installation

1 Using a thin-set mortar that is suitable for the substrate, apply the thin-set mortar (mixed to a fairly fluid consistency) taking care to flat trowel first before using the DITRA-HEAT trowel, or other 1/4" x 1/4" *(6m x 6mm)* square-notched trowel.

2 Apply DITRA-HEAT or DITRA-HEAT-DUO to the floor, fleece side down. Solidly embed the matting into the mortar using a float, screed trowel, or DITRA-ROLLER, making sure to observe the open time of the bonding mortar. If the mortar skins over prior to matting installation, remove and reapply. **Note:** It may be helpful to back roll the DITRA-HEAT matting before installation to help the membrane to lay flat.

When using the DITRA-ROLLER, place a weight (e.g., bags of mortar/grout or box of tile) not to exceed 75 lbs on the DITRA-ROLLER shelf. Slowly move the roller from one end of the matting to the other, slightly overlapping successive passes.

3 Lift up a corner of the matting to check coverage. Proper installation results in full contact between the fleece webbing and the thin-set mortar. DITRA-HEAT-DUO fleece may not pull up as much mortar from the floor as DITRA-HEAT when lifted, but full contact can be achieved as shown. **Note:** Coverage may vary with mortar consistency, angle at which the trowel is held, substrate flatness, etc. If full coverage is not achieved, remove and reapply, making sure to verify proper mortar consistency and application.



4 Abut end and side sections of adjacent sheets. **Note:** Aligning the studs on the top of the matting during installation can help make subsequent heating cable installation easier.

ESTIMATED THIN-SET COVERAGE

To bond DITRA-HEAT and DITRA-HEAT-DUO to the substrate, using the DITRA-HEAT trowel, or other 1/4" x 1/4" (6 mm x 6 mm) square-notched trowel:
Use one 50 lb. *(22.68 kg)* bag of mortar per 100 ft² *(9.3 m²)*.

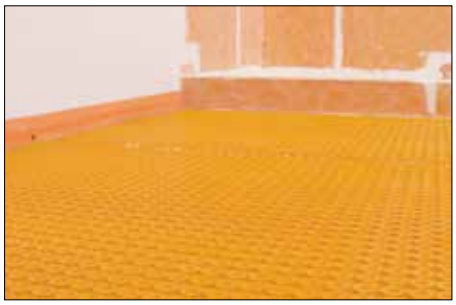
To bond the tile to the DITRA-HEAT, using a 1/4" x 3/8" *(6 mm x 10 mm)* square- or U-notched trowel: Use one 50 lb *(22.68 kg)* bag of mortar per 40 - 50 ft² *(3.7 - 4.6 m²)*.

To bond the tile to the DITRA-HEAT, using a 1/2" x 1/2" *(13 mm x 13 mm)* square- or U-notched trowel: Use one 50 lb *(22.68 kg)* bag of mortar per 30 - 40 ft² *(2.8 - 3.7 m²)*.

Membrane - DITRA-HEAT-PS and DITRA-HEAT-DUO-PS Installation

1 Remove release liner from DITRA-HEAT-PS / DITRA-HEAT-DUO-PS membrane.

2 Apply peel-and-stick membrane to the floor, fleece/adhesive side down. Solidly embed the matting into the substrate using a float, screed trowel, or DITRA-ROLLER. Proper installation results in full contact between the adhesive and substrate beneath.



3 Abut adjacent sheets and align the studs on the top of the matting to make subsequent heating cable installation easier.

ESTIMATED THIN-SET COVERAGE

To bond the tile to the DITRA-HEAT, using a 1/4" x 3/8" *(6 mm x 10 mm)* square- or U-notched trowel: Use one 50 lb *(22.68 kg)* bag of mortar per 40 - 50 ft^2 *(3.7 - 4.6 m^2)*.

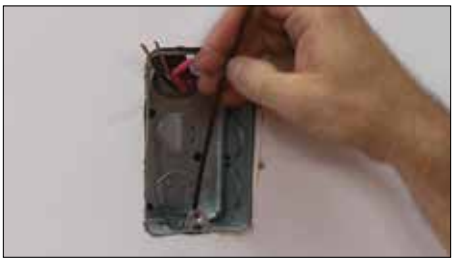
To bond the tile to the DITRA-HEAT, using a 1/2" x 1/2" *(13 mm x 13 mm)* square- or U-notched trowel: Use one 50 lb *(22.68 kg)* bag of mortar per 30 - 40 ft^2 *(2.8 - 3.7 m^2)*.

Installation

Refer to Warnings and Planning page 20-21 for important installation details.

It is recommended that the installation of the DITRA-HEAT system is photographed (e.g., heating cable layout, floor temperature sensor placements, factory cold lead splice, end splice location, and wide view of the room) for reference with future renovation work and troubleshooting. The homeowner/end user should retain these photos for their records.

1 Before the heating cable is removed from the spool, conduct the first set of required tests and record values in the heating cable tests log (page 39). If a break or damage is detected during the tests, return the heating cable to the original place of purchase.



2 Thread the heating cable cold lead through a conduit from the base of the wall to the thermostat electrical box. Floor temperature sensors need to be threaded through the same conduit containing the cold lead, or within a separate conduit.

Thermostat to Power Module Connection

The signal wire used to connect the DITRA-HEAT-E thermostats with DITRA-HEAT-E-RR/RRS power modules must be 300 volt rated and does not need to be in a conduit, if it has a proper flame rating (e.g., For USA: CL2, CL3, CL2R, CL3R, CL2P, CL3P, CM, CMG, CMR, CMP or for wood frame buildings only: CL2X, CL3X, or CMX

For Canada: CMG, CMR, CMP, FT4, FT6, or for wood frame buildings only: CMX, CMH, CM, or FT1.)

3 Mark where the factory cold lead splice will be placed, cut the DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS matting and subfloor (if needed to accommodate the thickness of the splice), and insert the splice. Use care to keep the factory cold lead splice completely embedded in mortar and use caution to avoid fasteners for baseboards penetrating the splice. It may be necessary to temporarily secure the splice to the floor with thin-set mortar or adhesive (e.g., KERDI-FIX or hot glue).

Once the heating cable cold lead and floor temperature sensors are threaded to the thermostat electrical box, install a metal protection plate at the base of the wall. This will help prevent any damage from fasteners (e.g., nails, screws, etc.) in the future.

4 Embed the heating cables between studs utilizing the recommended pattern, at a spacing determined in the **Spacing Details** section on page 20-21.

A repeating 2 stud or narrower spacing shall not be used as it may cause overheating and cable malfunction. Exception: A two-stud spacing is used when connecting a 240 V cable to a 208 V power source. See page 35 for more information.

A wider spacing (e.g., 4 studs or more) will not provide sufficient power to warm the floor to the desired temperature.

5 Use care not to damage the cables during installation, particularly before the cables are embedded in the matting.

Notes:

- Make sure to leave space for inserting the floor temperature sensors.
- Heating cables may not touch, cross over, or overlap one another or itself.
- Minimum spacing from:
  - Walls, partitions, and fixed cabinets is 2" *(50 mm)*
  - Forced air heating vents is 4" *(100 mm)*
  - Centerline of toilet drain is 7" *(180 mm)*
  - Edge of any drain pipe is 4" *(100 mm).* For the linear drain, the cable must be 4" *(100 mm)* from the actual drain pipe and a minimum of 1" *(25 mm)* from the channel body edges.
  - Other heating sources (baseboard heaters and other fixed heating devices, fireplaces, etc.) is 8" *(200 mm)*

6 Two floor temperature sensors must be installed in the floor assembly. We recommend installing each of the sensors at a different location on the floor, evenly spaced between two cable runs, and ideally towards the middle of the heating cable layout. However, a minimum of 12" *(305 mm)* into the cable layout is recommended to obtain satisfactory temperature readings. When continuously alternating 3-2 stud spacing is used, install the sensors in the middle of a 3 stud cable spacing section when flooring material is ceramic, porcelain, or stone tiles. When AFC's (see AFC section on page 18) are used, install sensors in the middle of a 2 stud cable spacing section. Mark the sensor location on the DITRA-HEAT and cut the matting to recess the sensor. It is recommended to temporarily remove the heating cable from the area while cutting the matting. It may be necessary to temporarily secure the sensor to the floor with thin-set mortar or adhesive (e.g., KERDI-FIX or hot glue). Embed the sensor wire in the matting without overlapping or crossing the heating cable.

7 Once the heating cable and floor temperature sensor installation is complete, retest and record values in the heating cable tests log (page 39).

Extending the heating cable cold lead

The cold lead is made up of two 14 AWG conductors with a copper braided shield, that is used as the grounding conductor. The extension must be made with building wire that is suitable for this application and complies with applicable building and electrical codes. The cold lead itself is not made of building wire and therefore cannot pass through studs unless run through a conduit. Extension of the cold lead requires the addition of a “code compliant” junction box that must be accessible at all times. The maximum length for extending the cold lead is dependent upon the gauge and rating of the extension cable used. Consult with a qualified person to discuss the needs of your specific application.

Extending the floor temperature sensor

The floor temperature sensor can be extended using a 22 AWG, 2-wire cable. For installation of sensor extension wire without conduit, see page 24 for requirements. We recommend twisting and soldering the wires and using electrical tape to insulate them. Schluter-Systems does not limit the length of the extension; however, the longer the extension, the greater the possibility that the quality of the signal (and resulting temperature sensing) will be skewed. Regardless of the method used, the resulting splice must comply with applicable building and electrical codes. A loose connection between the extension and the sensor will result in a false reading or an error code.

Waterproofing

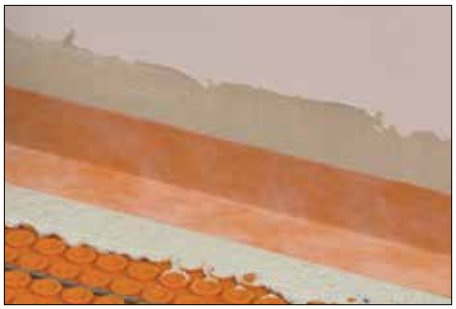
The following steps are required for waterproofing only:

Note: While the heating cable is protected by the DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS matting, be careful when applying the mortar to not damage the cable with the notched trowel.

1 At the joints, fill the matting with Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar, approximately 8" *(203 mm)* wide, centered over the joint.

2 Comb additional Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar over the joint using a 1/4" x 3/16" *(6 mm x 5 mm)* V-notched trowel or the KERDI-TROWEL, which features a 1/8" x 1/8" *(3 mm x 3 mm)* square-notched design.

3 Apply 5" *(127 mm)*-wide KERDI-BAND, centered over the joint. Using the flat side of the trowel, firmly press the banding into the mortar to ensure 100% coverage and to remove excess mortar and air pockets.



4 At all wall junctions, apply KERDI-BAND as described in steps 1-3, centered where the wall and floor meet. In some applications the vertical section of the floor/wall transition will not accept a bond to unmodified thin-set mortar. Connections to such elements can be achieved using KERDI-FIX sealant and bonding compound or suitable trowel-applied waterproofing materials, such as those that require atmospheric moisture to cure (e.g., urethane sealant). Install KERDI-KERECK at all inside and outside corners

Note: KERDI-BAND must lap DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS at seams and at floor/wall transitions by a minimum of 2" *(50 mm)* in order to maintain waterproof integrity.

Waterproofing - Peel-and-Stick Membranes

For applications requiring compliance with or certification to the ANSI A118.10 American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation, select the DITRA-HEAT or DITRA-HEAT-DUO membranes that are installed with thin-set mortar. Alternatively, the DITRA-HEAT-PS or DITRA-HEAT-DUO-PS membranes may be covered with the certified KERDI membrane.

All DITRA-HEAT installations can be made waterproof by sealing the joints with KERDI-BAND.

Tiles

Note: While the heating cable is protected by the DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS matting, be careful when applying the mortar to not damage the cable with the notched trowel.

1 Tile can be installed over DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS immediately; no need to wait for the mortar to cure. Fill the matting with Schluter SET, ALL-SET, FAST-SET, or unmodified thin-set mortar and comb additional mortar over the matting using a trowel that is appropriate for the size of the tile.

2 Solidly embed the tiles in the setting material, sliding the tile back and forth perpendicular to the tile ridges underneath. This will help collapse the mortar ridges and improve contact between the mortar and the tile. Make sure to observe the open time of the bonding mortar. If the mortar skins over prior to tile installation, remove and reapply.

3 Periodically remove and check a tile to ensure that full coverage is being attained.

Note: Coverage may vary with mortar consistency, angle at which the trowel is held, substrate flatness, etc. If full coverage is not achieved, remove and reapply, making sure to verify proper mortar consistency and application. For large-format tiles, e.g., 12" x 12" *(305 mm x 305 mm)* and larger, back-buttering the tiles with a skim coat of thin-set mortar is a useful way to help ensure proper coverage. The skim coat can fill in the concave area on the back of the tile (ceramic tiles are not perfectly flat) and improve contact with the mortar combed on the substrate.

Tile to be installed according to ANSI A108.5. The average contact area for dry areas shall not be less than 80% and for wet areas shall not be less than 95%.

4 Once the tile installation is complete, retest the heating cable and record values in the heating cable tests log (page 39).

Allow the assembly to cure for a minimum of 7 days after grouting before putting the floor warming into service.
For natural stone applications, extended curing times after grouting are recommended.

ESTIMATED THIN-SET COVERAGE

To bond DITRA-HEAT and DITRA-HEAT-DUO to the substrate, using the DITRA-HEAT trowel, or other 1/4" x 1/4" (6 mm x 6 mm) square-notched trowel:
Use one 50 lb. *(22.68 kg)* bag of mortar per 100 ft^2 *(9.3 m^2)*.

To bond the tile to the DITRA-HEAT, using a 1/4" x 3/8" *(6 mm x 10 mm)* square- or U-notched trowel:
Use one 50 lb *(22.68 kg)* bag of mortar per 40 - 50 ft^2 *(3.7 - 4.6 m^2)*.

To bond the tile to the DITRA-HEAT, using a 1/2" x 1/2" *(13 mm x 13 mm)* square- or U-notched trowel:
Use one 50 lb *(22.68 kg)* bag of mortar per 30 - 40 ft^2 *(2.8 - 3.7 m^2)*.

THIN-SET FACTS

Discussion of thin-set mortars and Schluter®-DITRA-HEAT installations

Schluter-Systems offers thin-set mortars designed for use with Schluter membranes and boards. All Schluter-Systems' thin-set mortars, including the Schluter ALL-SET® and Schluter FAST-SET® modified varieties, can be used to set tile over Schluter®-DITRA, DITRA-HEAT, KERDI, KERDI-BOARD non absorptive substrates. If Schluter thin-set mortars are not used, we require unmodified thin-set mortar when setting ceramic or porcelain tile over DITRA-HEAT.

QUESTION: Can ceramic tile, including porcelain tile, be set on DITRA-HEAT with unmodified thin-set mortar?

ANSWER: YES. In fact, we recommend it. Here's why:

Portland cement-based unmodified thin-set mortars are dependent on the presence of moisture for hydration in order to gain strength. Since DITRA-HEAT is impervious, it does not deprive the mortar of its moisture. This allows the cement to properly hydrate, resulting in a strong, dense bond coat. In fact, after the mortar has reached final set (usually within 24 hours), unmodified thin-set mortars achieve higher strengths when cured in continually moist conditions.

QUESTION: Can ceramic tile, including porcelain tile, be set on DITRA-HEAT with latex-modified thin-set mortar?

ANSWER: No.

Latex-modified mortars must dry for the polymers to coalesce and form a hard film in order to gain strength. When sandwiched between two impervious materials such as DITRA-HEAT and ceramic tile, including porcelain tile, drying takes place very slowly through the open joints in the tile covering. [According to the TCNA Handbook for Ceramic, Glass, and Stone Tile Installation, this drying period can fluctuate from 14 days to over 60 days, depending on the geographic location, the climatic conditions, etc.]. Therefore, extended cure times could be required before grouting if using modified thin-set mortars between DITRA-HEAT and ceramic tile, including porcelain tile. If extended cure times were not observed, the results could be unpredictable.

QUESTION: Can Schluter ALL-SET® and Schluter FAST-SET® modified thin-set mortars be used to set tile over Schluter boards and membranes?

ANSWER: Yes.

All Schluter thin-set mortars, including the Schluter ALL-SET® and Schluter FAST-SET® modified varieties can be used to set tile over Schluter®-DITRA, DITRA-HEAT, KERDI, KERDI-BOARD, etc. non absorptive substrates.

QUESTION: How is this possible?

ANSWER: The key is predictability.

Schluter-Systems' modified thin-set mortars have been specifically formulated to set and gain strength in a timeframe that fits typical installation practice, even when sandwiched between Schluter membranes or boards and porcelain tile. The proportions of cement, water-retention agents, polymers, and other components in the mixtures were balanced to ensure that extended dry times are not required. This was validated through both laboratory and practical testing. Now, the installer can select from either unmodified or modified thin-set mortar to install tiles within our systems according to his or her preference.

QUESTION: Why did Schluter-Systems change its position on thin-set mortar?

ANSWER: We haven't changed our position on thin-set mortar use within our systems.

Developing our own setting materials has given us the ability to guarantee consistently positive results. And since we control the formulas, we can be sure no changes will be made that have a negative impact on setting times and strength gain in these environments.

QUESTION: Does this mean I can use other manufacturers' modified thin-set mortars to install tile over Schluter boards and membranes?

ANSWER: No.

Our position on thin-set mortar use within our systems in general has not changed. We have no control over the formulation of other manufacturers' products, and therefore, we cannot guarantee consistently positive results with their modified thin-set mortars.

QUESTION: Can I still use other manufacturers' unmodified thin-set mortars to install tile over Schluter boards and membranes?

ANSWER: Yes.

We still warrant the use of unmodified thin-set mortar meeting ANSI A118.1 to install tile within our systems because we have confidence in the performance of this product category. This is based on the science of cement hydration and years of positive testing and field experience.

Please note, if Schluter thin-set mortars are used with Schluter membranes, an extended system warranty is available.

ADDITIONAL NOTES

Pre-mixed thin-set mortars and mastics are not suitable for use in conjuction with DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS .

Remember, the type of mortar used to apply DITRA-HEAT depends on the type of substrate. The mortar must bond to the substrate and mechanically anchor the fleece on the underside of the DITRA-HEAT. For example, bonding DITRA-HEAT to wood requires latex-modified thin-set mortar. When bonding DITRA-HEAT to particularly dry, porous concrete with unmodified thin-set mortar, the slab should be moistened to saturate the concrete and help prevent premature drying of the mortar. Excess or standing surface water must be removed prior to installation. Additionally, all mortars (modified and unmodified) have an acceptable temperature range that must be observed during application and curing.

HEATING CABLE SPECIFICATION

Schluter®-DITRA-HEAT-E-HK

DITRA-HEAT-E-HK are twisted pair heating cables designed for integration with the DITRA-HEAT/-PS and DITRA-HEAT-DUO/-PS uncoupling membranes in interior floor warming applications.

Item No.	Heating Cable Length		Area Covered per Cable Spacing				Total Power	Avg. Power per Unit Area per Cable Spacing				Current
			Regular 3 Stud		Alternating 3-2 Stud			Regular 3 Stud		Alternating 3-2 Stud		
	(ft)	(m)	(ft^2)	(m^2)	(ft^2)	(m^2)	(W)	(Watts/ft^2)	(Watts/m^2)	(Watts/ft^2)	(Watts/m^2)	(Amps)
Heating Cable (120 V)												
DHE HK 120 11	35.3	10.8	10.7	1.0	8.9	0.8	135	12.6	136	15.2	164	1.1
DHE HK 120 16	52.9	16.1	16.0	1.5	13.3	1.2	203	12.7	136	15.2	164	1.7
DHE HK 120 21	70.5	21.5	21.3	2.0	17.8	1.7	270	12.7	136	15.2	164	2.3
DHE HK 120 27	88.2	26.9	26.7	2.5	22.2	2.1	338	12.7	136	15.2	164	2.8
DHE HK 120 32	105.8	32.2	32.0	3.0	26.7	2.5	405	12.7	136	15.2	164	3.4
DHE HK 120 38	124.1	37.8	37.5	3.5	31.3	2.9	475	12.7	136	15.2	164	4.0
DHE HK 120 43	141.1	43.0	42.7	4.0	35.6	3.3	540	12.7	136	15.2	164	4.5
DHE HK 120 51	169.8	51.8	51.4	4.8	42.8	4.0	650	12.7	136	15.2	164	5.4
DHE HK 120 64	212.9	64.9	64.4	6.0	53.7	5.0	815	12.7	136	15.2	164	6.8
DHE HK 120 73	240.2	73.2	72.7	6.8	60.6	5.6	920	12.7	136	15.2	164	7.7
DHE HK 120 83	275.5	84.0	83.3	7.7	69.4	6.5	1055	12.7	136	15.2	164	8.8
DHE HK 120 92	303.0	92.4	91.7	8.5	76.4	7.1	1160	12.7	136	15.2	164	9.7
DHE HK 120 102	336.9	102.7	101.9	9.5	84.9	7.9	1290	12.7	136	15.2	164	10.7
DHE HK 120 113	372.2	113.4	112.6	10.5	93.8	8.7	1425	12.7	136	15.2	164	11.9
DHE HK 120 134	444.0	135.3	134.3	12.5	111.9	10.4	1700	12.7	136	15.2	164	14.2
Heating Cable (240 V)												
DHE HK 240 11	35.3	10.8	10.7	1.0	8.9	0.8	135	12.6	136	15.2	164	0.6
DHE HK 240 16	53.1	16.2	16.1	1.5	13.4	1.2	203	12.6	136	15.2	164	0.8
DHE HK 240 21	70.6	21.5	21.4	2.0	17.8	1.7	270	12.7	136	15.2	164	1.1
DHE HK 240 27	88.2	26.9	26.7	2.5	22.2	2.1	338	12.7	136	15.2	164	1.4
DHE HK 240 32	105.8	32.2	32.0	3.0	26.7	2.5	405	12.7	136	15.2	164	1.7
DHE HK 240 38	124.1	37.8	37.5	3.5	31.3	2.9	475	12.7	136	15.2	164	2.0
DHE HK 240 43	141.0	43.0	42.6	4.0	35.5	3.3	540	12.7	136	15.2	164	2.3
DHE HK 240 53	176.3	53.7	53.3	5.0	44.4	4.1	675	12.7	136	15.2	164	2.8
DHE HK 240 64	211.6	64.5	64.0	5.9	53.3	5.0	810	12.7	136	15.2	164	3.4
DHE HK 240 75	248.2	75.7	75.1	7.0	62.6	5.8	950	12.7	136	15.2	164	4.0
DHE HK 240 85	282.1	86.0	85.3	7.9	71.1	6.6	1080	12.7	136	15.2	164	4.5
DHE HK 240 103	339.4	103.4	102.7	9.5	85.6	7.9	1300	12.7	136	15.2	164	5.4
DHE HK 240 129	425.8	129.8	128.8	12.0	107.3	10.0	1630	12.7	136	15.2	164	6.8
DHE HK 240 145	480.5	146.5	145.3	13.5	121.1	11.3	1840	12.7	136	15.2	164	7.7
DHE HK 240 167	551.0	167.9	166.7	15.5	138.9	12.9	2110	12.7	136	15.2	164	8.8
DHE HK 240 183	605.9	184.7	183.3	17.0	152.7	14.2	2320	12.7	136	15.2	164	9.7
DHE HK 240 204	673.8	205.4	203.8	18.9	169.9	15.8	2580	12.7	136	15.2	164	10.7
DHE HK 240 225	744.4	226.9	225.2	20.9	187.7	17.4	2850	12.7	136	15.2	164	11.9

Each heating cable box includes two floor temperature sensors compatible with the DITRA-HEAT-E thermostats. Each heating cable features an approximately 7 ft *(2.1 m)* long cold lead.

TESTING & CERTIFICATIONS

Product Evaluation

Schluter-Systems is committed to providing reliable installation systems for ceramic and stone tile. As part of this commitment, we have invested considerable resources in testing our products and obtaining certifications where applicable to provide our customers and local code officials with relevant data that supports the efficacy of our systems. All the testing referenced below was performed by independent laboratories.

Uncoupling and Support/Load Distribution

The method used to establish the overall performance of a tile assembly under loading is the ASTM C627 "Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson Type Floor Tester." The assembly is tested in cycles using a loaded, revolving carriage. Load, wheel hardness, and number of revolutions vary with each cycle. Once a specified level of damage is exceeded, the test is stopped. The TCNA Handbook for Ceramic, Glass, and Stone Tile Installation assigns performance levels to an assembly based on the number of cycles successfully completed. The ratings include residential, light, moderate, heavy, and extra heavy, in order of improving performance.

Report Number	Substrate	Joist Spacing	Tile	Rating
Schluter®-DITRA-HEAT				
TCNA-415-13	OSB	19.2" o.c.	12" x 12" porcelain	Extra Heavy
TCNA-415-13	OSB	24" o.c.	12" x 12" carrara marble	Light
TTMAC-UFT09-2013	Concrete	N/A	12" x 12" porcelain	Moderate
TCNA-415-13	Concrete	N/A	2" x 2" porcelain	Light
Schluter®-DITRA-HEAT-DUO				
TCNA-455-15 (1)	Concrete	N/A	12" x 12" porcelain	Light
TCNA-455-15 (2)	Concrete	N/A	2" x 2" porcelain	Residential
TNCA-455-15 (3)	Concrete	N/A	12" x 12" marble	Light
TCNA-455-15 (4)	Plywood	19.2" o.c.	12" x 12" porcelain	Light

Assembly Notes:

1. All plywood and OSB subfloors were 23/32" (3/4" nom.) -thick; 11/32" (3/8" nom.) -thick OSB underlayment added for carrara marble test
2. Modified thin-set mortar (ANSI A118.11) to bond membrane to plywood and OSB
3. Unmodified thin-set mortar (ANSI A118.1) to bond membrane to concrete
4. Unmodified thin-set mortar (ANSI A118.1) to bond tile to membrane
5. High Performance Cement Grout (ANSI A118.7)

The test results above demonstrate that DITRA-HEAT performs extremely well under load while at the same time providing flexibility within the shear plane. DITRA-HEAT-DUO was found to be suitable for residential and light commercial traffic, depending on the substrate and tile chosen.

Report Number	Substrate	Joist Spacing	Tile	Rating
Schluter®-DITRA-HEAT-PS				
UFT001-2022	Concrete	N/A	12" x 12" porcelain	Extra Heavy (14 cycles)
UFT008-2021	OSB	19.2" o.c.	12" x 12" porcelain	Light (7 cycles)
Schluter®-DITRA-HEAT-DUO-PS				
UFT004-2022	Concrete	N/A	12" x 12" porcelain	Light (8 cycles)
UFT009-2021	OSB	19.2" o.c.	12" x 12" porcelain	Light (7 cycles)

Waterproofing

DITRA-HEAT and DITRA-HEAT-DUO provide reliable waterproofing in interior applications. The products have been found to meet or exceed the requirements of the American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-set Ceramic Tile and Stone Installation A118.10.

Note: DITRA-HEAT-PS and DITRA-HEAT-DUO-PS do not meet requirements of ANSI A118.10.

Sound Control

DITRA-HEAT-DUO reduces impact sound transmission through floor-ceiling assemblies and supports the covering to ensure a lasting installation.

No.	Report	Test	Floor	Ceiling	Results
Schluter®-DITRA-HEAT-DUO					
1	NGC 7017176	ASTM E2179	8" Concrete	N/A	ΔIIC = 20
2	IN17-007	ASTM E492	8" Concrete	N/A	IIC = 50
3	IN18_001	ASTM E492	8" Concrete	9" wire suspended ceiling with gypsum board	IIC = 67 STC 63
4	IN17_059	ASTM E492	6" Concrete	RSIC-1 clips with gypsum board	IIC = 60 STC 61

*All assemblies featured 12" x 12" porcelain tile over DITRA-HEAT-DUO installed with cement based thin-set mortars and grouts

DITRA-HEAT-DUO has been found to meet or exceed the requirements of the American National Specifications for Bonded Sound Reduction Membranes for Thin-Set Ceramic Tile Installation A118.13.

Vapor Management

The free space under the DITRA-HEAT and DITRA-HEAT-DUO mattings allow the substrate to breathe, while the material composition provides for a very low water vapor permeance, which prevents any significant vapor intrusion in the tile assembly from below.

Product	Test Method	Performance
Schluter®-DITRA-HEAT	ASTM E96*	0.21 perms
Schluter®-DITRA-HEAT-DUO		0.48 perms

*Using the water method at 73ºF *(23ºC)* and 50% RH

The result is the DITRA-HEAT and DITRA-HEAT-DUO effectively manage vapor and prevent damage to the tile covering as a result.

Certifications

Heating Cables

The DITRA-HEAT-E-HK heating cables sets are certified or listed to the following standards and usage:

- CAN/CSA-C22.2 No. 130-16 "Requirements for Electrical Resistance Trace Heating and Heating Device Sets" under usage markings GXW for general use (G) with a wet rating (W), but specifically (X) for floor embedded indoor floor warming applications.

For products bearing the cCSAus certification mark:

- UL 1673 "Electric Space Heating Cables" for installation in poured masonry floors within enclosed structures.

For products bearing the cULus certification mark:

- UL 1683 "Outline of investigation for Electric Heating Products For Installation Under Floor Coverings"

Thermostat

The DITRA-HEAT-E-RS1 AND DITRA-HEAT-E-WiFi thermostats WiFi radio chips are authorized by the FCC (USA) and IC (Canada) under the following numbers:

For the RS1: - FCC ID = 2AC7Z-ESPWROOM32
- IC ID = 21098-ESPWROOM32

For the WiFi: - FCC ID = AZY-HF-LPT200
- IC ID = 12243A-HFLPT2001

The DITRA-HEAT-E-RS1/-WiFi/-RT/-R digital thermostats are UL listed according to the following standards:

- UL 60730-1 “Automatic Electrical Controls for Household and Similar Use – Part 1: General Requirements”
- UL 60730-2-9 “Automatic Electrical Controls for Household and Similar Use – Part 2-9: Particular Requirements for Temperature Sensing Controls”
- CSA E60730-1 “Automatic Electrical Controls for Household and Similar Use – Part 1: General Requirements”
- CSA E60730-2-9 “Automatic Electrical Controls for Household and Similar Use – Part 2-9: Particular Requirements for Temperature Sensing Controls”
- UL 943 "Ground-Fault Circuit Interrupters”
- CSA C22.2 No. 144.1 "Ground-Fault Circuit Interrupters”

Note: iPhones running iOS older than version 10 and Android running versions older than 6 are not officially supported by the DITRA-HEAT-E-RS1 App.

Membrane

DITRA-HEAT:

- ICC-ES Report No. ESR-2467
- ICC-ES PMG Report No. PMG-1204

DITRA-HEAT-DUO:

- ICC-ES Report No. ESR-2467
- ICC-ES PMG Report No. PMG-1204

*DITRA-HEAT-PS and DITRA-HEAT-DUO-PS are not included in above ICC-ES Report No. ESR-2467 or ICC-ES Report No. PMG-1204

Certifications and listings may be accessed via our website at www.schluter.com

Green Building

DITRA-HEAT and DITRA-HEAT-DUO have been evaluated according to the "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1" for California Specification 01350 and found to comply with the VOC requirements. California Specification 01350 is referenced by various green building standards and rating systems.

SOUND CONTROL

Discussion of sound control in conjunction with ceramic & stone tile

Controlling sound transmission through floor/ceiling assemblies in multi-story construction can present challenges to architects and design professionals, particularly when hard surface coverings, including ceramic and stone tiles, are used. This is because sound control materials tend to be compressible and may not provide adequate support for the tile layer in thin-set applications. However, there are practical methods that allow for the use of tile and stone while providing sound transmission control.

Sound transmission evaluation and requirements

Impact sound transmission through floor-ceiling assemblies is most commonly measured in the laboratory according to test method ASTM E492. The measured data is used to calculate a single-number rating per ASTM E989 called impact insulation class (IIC). The contribution of a flooring assembly to the IIC of an assembly with a concrete slab subfloor can be determined using the ASTM E2179 test method. The test method yields a rating called ΔIIC (delta IIC), and measures the performance of the combination of all elements above the concrete. ΔIIC values are useful tools to compare the performance of different flooring assemblies over a concrete slab. However, full assembly testing can be used as the basis for designing floor-ceiling assemblies to meet impact sound control requirements. For example, the International Building Code (IBC) requires a minimum IIC of 50 and the International Residential Code (IRC) a minimum IIC of 45. Condominium or homeowners associations may have their own requirements, which are typically higher than code minimums.

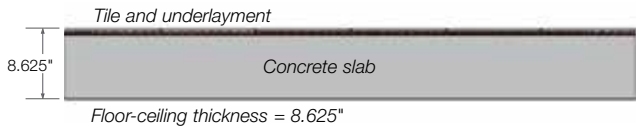
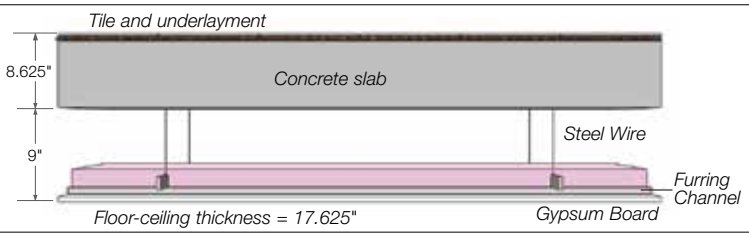
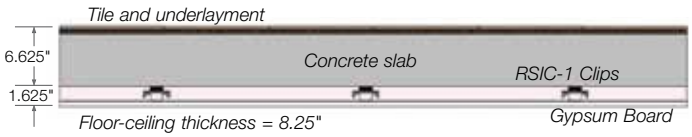
Schluter®-DITRA-HEAT-DUO

DITRA-HEAT integrates electric floor warming with the functions associated with DITRA: uncoupling, waterproofing, vapor management and load support. DITRA-HEAT-DUO/-PS integrates two additional benefits: reducing impact sound transmission through floor-ceiling assemblies and providing faster warm-up times. While sound control materials tend to be compressible, DITRA-HEAT-DUO/-PS supports the covering to ensure a lasting installation. This versatility makes the system an ideal solution for ceramic and stone tile floor installations in many applications, such as multi-story residential construction, hotel guest rooms, and many more.

Test Results

Test results of assemblies with DITRA-HEAT-DUO and porcelain tile over concrete are listed in the table below. DITRA-HEAT-DUO with porcelain tile received a rating of ΔIIC 20, a significant contribution to sound rated floor-ceiling designs. To further improve IIC ratings, sound rated ceilings can be installed below the subfloor. Wood construction sound tests are in progress.

No.	Report	Test	Floor	Ceiling	Results
Schluter®-DITRA-HEAT-DUO					
1	NGC 7016078	ASTM E2179	8" Concrete	N/A	ΔIIC = 20
2	IN17-007	ASTM E492	8" Concrete	N/A	IIC = 50
3	IN18_001	ASTM E492	8" Concrete	9" wire suspended ceiling with gypsum board	IIC = 67 STC 63
4	IN17_059	ASTM E492	6" Concrete	RSIC-1 clips with gypsum board	IIC = 60 STC 61

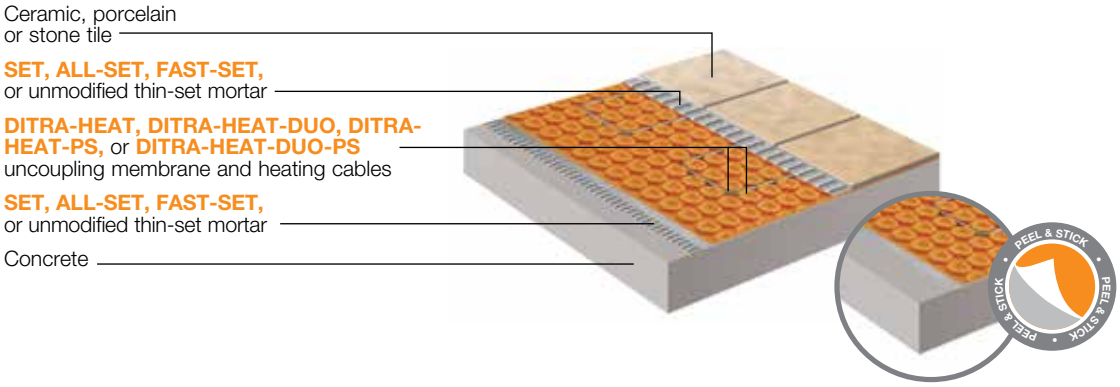
No.	Report	Floor-Ceiling Sketch
Schluter®-DITRA-HEAT-DUO		
1 **2**	• 8" concrete slab • No ceiling	
3	• 8" concrete slab • 9" wire-suspended ceiling with cold rolled steel and 7/8" furring channel • R-11 unfaced fiberglass batt insulation • 5/8" gypsum board	
4	• 6" concrete slab • RSIC-1 clips with 7/8" furring channel • R-11 unfaced fiberglass batt insulation • 5/8" gypsum board	

*All assemblies featured 12" x 12" porcelain tile over DITRA-HEAT-DUO installed with cement based thin-set mortars and grouts

Installation Considerations

In laboratory testing, sound energy transmission is directed through the test specimen only, with negligible transfer through other paths. The values provide an accurate picture of the sound control characteristics of the test specimen itself. However, floor/ceiling assemblies may not perform as expected in the field if they are not isolated from adjacent walls to prevent sound energy transfer. Thus, perimeter joints are not only necessary to accommodate expansion of the tile assembly, but to also prevent “flanking” sound transfer. Schluter-Systems provides a range of prefabricated movement joint profiles that can be used for these purposes.

DH-C-TS



DITRA-HEAT-DUO

Solution to improve floor warming response time

The challenge of concrete substrates

Concrete substrates can absorb enough heat energy to significantly increase the time it takes for floors to warm up, particularly when there is no insulation layer below the concrete. In some cases, floors may never reach the desired temperature. There are solutions suggested by other heating cable manufacturers to address this challenge, such as installing the heating cables at closer spacing for increased energy output or installing a thermal break prior to heating cable installation to reduce heat loss into the substrate. However, both of these solutions increase material and labor costs.

A one-step solution

DITRA-HEAT-DUO/-PS offers the same functions as the DITRA-HEAT/-PS membrane, but also features an integrated thermal break in the form of a thicker bonding fleece. The thermal break reduces the initial rates of heat loss to the substrate, and improves the floor warming response time during temperature ramp-ups. Since an effective thermal break can be created with a relatively low R-value, the DITRA-HEAT-DUO/-PS membrane is only 5/16" *(8 mm)*-thick, compared to DITRA-HEAT/-PS at 1/4" *(5.5 mm)*-thick.

Thermal resistance

The DITRA-HEAT-DUO thermal break was tested according to the ASTM C518 “Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus” and determined to have an R-value of 0.35. This value may seem low, but it is sufficient to improve the system warm up time. If improving overall energy efficiency is desired and the floor warming system is to be used for extended periods of time (i.e more than early mornings and/or evenings), increased thermal resistance may be required.

Floor warming performance

In laboratory testing, when heating the floor from 68°F *(20°C)* to 78°F *(25°C)*, DITRA-HEAT-DUO reduced floor warming response time by approximately 80% (90 minutes) compared to DITRA-HEAT over a concrete substrate.

Wood substrates act as insulators and typically do not pose the same challenges as concrete substrates. In the same laboratory testing, when heating the floor from 68°F *(20°C)* to 78°F *(25°C)*, DITRA-HEAT-DUO only reduced floor warming response time by approximately 20% (5 minutes) compared to DITRA-HEAT over a plywood substrate.

Figure 1 - DITRA-HEAT-DUO Performance over Concrete

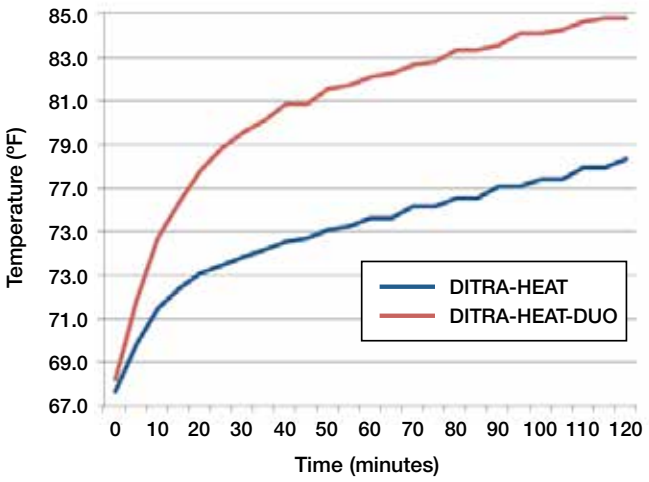
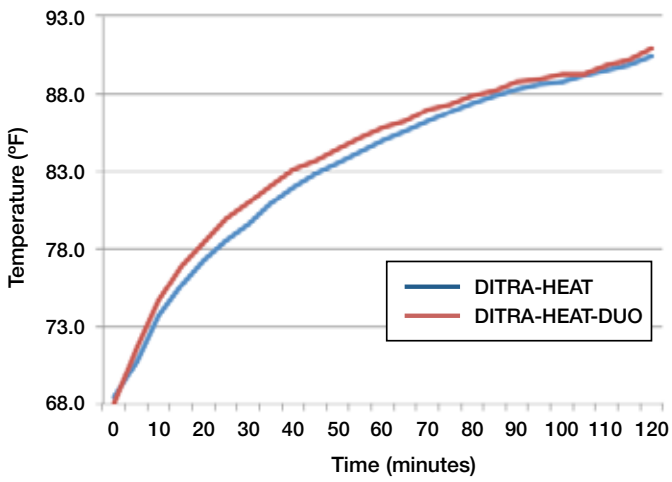


Figure 2 - DITRA-HEAT-DUO Performance over Wood



DITRA-HEAT-E-HK heating cables were spaced at three studs in all of the above tests.

Results above are based upon laboratory testing. Actual results may vary depending on various factors, including concrete substrate thickness, concrete substrate temperature, room temperature, heat losses, etc.

CONCRETE SUBFLOORS

Discussion on Schluter®-DITRA-HEAT installations over concrete subfloors

Concrete substrates absorb more heat energy than wood substrates. As such, the time required for an electric floor warming system, such as DITRA-HEAT, to bring a tile covering to the desired temperature will be longer for applications over concrete than for applications over plywood/OSB. The warm up time will vary depending on many factors, including concrete thickness, temperature, location, and insulation. Therefore Schluter Systems cannot predict or guarantee the temperature increase over time as follows:

Elevated Concrete

Elevated concrete substrates, as found in multi-story residential construction, hotels, etc. will typically be located over another occupied space that is at or near room temperature. For these applications, the DITRA-HEAT-DUO/-PS membrane with integrated thermal break is an excellent means to reduce the warm up time and will typically produce satisfactory results.

Concrete on or Below Grade

Concrete substrates placed on or below grade, as in basements or first floors of single-family dwellings, have the potential to absorb even more heat energy than elevated concrete substrates and further extend the warm up time. This effect is exacerbated if there is no insulation provided below the concrete on ground.

If the concrete on grade is sufficiently insulated, the DITRA-HEAT-DUO/-PS membrane with integrated thermal break can reduce the warm up time and satisfactory results will typically be achieved. If the concrete is not insulated, the DITRA-HEAT-DUO/-PS thermal break is likely not sufficient to reduce the warm up time to a satisfactory value. In fact, it is possible that the heat loss to the concrete is such that the tile covering will not reach the desired temperature. For these applications, it is likely that providing insulation on top of the concrete will be required to produce satisfactory floor warming performance. If providing insulation on top of the concrete is not possible, the use of the continuously alternating 3-2 stud heating cable spacing is recommended. This alternating cable spacing will provide a 20% increase in heat output compared to the 3 stud spacing and a similar reduction in warm up time, over and above the reduction obtained with the DITRA-HEAT-DUO/-PS membrane, depending on your particular application or installation. Please contact a design professional (e.g., HVAC contractor, engineer or architect) and Schluter-Systems to discuss such projects during the planning stage.

208 V APPLICATIONS

Discussion of Schluter®-DITRA-HEAT-E-HK Heating Cables in 208 V Applications

DITRA-HEAT offers complete flexibility when creating warm floors in any application. DITRA-HEAT-E-HK heating cables are designed for use with common 120 V and 240 V power sources. 208 V power sources are used in some cases to handle larger loads (e.g., HVAC equipment, motors, etc.) or to improve energy efficiency.

Schluter-Systems recommends using the DITRA-HEAT-E-HK 240 V heating cables when a 208 V power source is present. However, this will reduce the heating power by 25% to 9.5 W/ft^2 at the standard 3-stud cable spacing, which may not be sufficient power to warm the floor in these applications. To offset the effect of the lower voltage, we recommend installing the heating cable at a 2-stud spacing in these applications. This results in an increased heating power of 14.2 W/ft^2, which will ensure adequate performance.

The heating cable will cover 33% less area when spaced at 2 studs compared to 3 studs. Therefore, a longer heating cable must be selected to cover a given area in these applications. Coverage for each 240 V heating cable spaced at 2 studs can be found in the table below.

DITRA-HEAT-E-HK 240 V Heating Cables in 208 V Applications at 2 Stud Spacing

Item No.	Length (ft - m)	Area (ft^2 - m^2)	Power (W)	Average Power (W/ft^2 - W/m^2)	Current (A)
DHE HK 240 11	35.3 – 10.8	7.1 – 0.7	101	14.2 - 152.8	0.5
DHE HK 240 16	53.1 – 16.2	10.7 – 1.0	152	14.2 - 152.8	0.7
DHE HK 240 21	70.5 – 21.5	14.2 – 1.3	203	14.2 - 152.8	1.0
DHE HK 240 27	88.2 – 26.9	17.8 – 1.7	254	14.2 - 152.8	1.2
DHE HK 240 32	105.8 – 32.2	21.3 – 2.0	304	14.2 - 152.8	1.5
DHE HK 240 38	124.1 – 37.8	25.0 – 2.3	356	14.2 - 152.8	1.7
DHE HK 240 43	141 – 43.0	28.4 – 2.6	405	14.2 - 152.8	1.9
DHE HK 240 53	176.3 – 53.7	35.5 – 3.3	506	14.2 - 152.8	2.4
DHE HK 240 64	211.6 – 64.5	42.7 – 4.0	608	14.2 - 152.8	2.9
DHE HK 240 75	248.2 – 75.7	50.0 – 4.7	713	14.2 - 152.8	3.4
DHE HK 240 85	282.1 – 86.0	56.9 – 5.3	810	14.2 - 152.8	3.9
DHE HK 240 103	339.4 – 103.4	68.4 – 6.4	975	14.2 - 152.8	4.7
DHE HK 240 129	425.8 – 129.8	85.8 – 8.0	1223	14.2 - 152.8	5.9
DHE HK 240 145	480.5 – 146.5	96.9 – 9.0	1380	14.2 - 152.8	6.6
DHE HK 240 167	551 – 167.9	111.1 – 10.3	1583	14.2 - 152.8	7.6
DHE HK 240 183	605.9 – 184.7	122.1 – 11.4	1740	14.2 - 152.8	8.4
DHE HK 240 204	673.8 – 205.4	135.8 – 12.6	1935	14.2 - 152.8	9.3
DHE HK 240 225	744.4 – 226.9	150.1 – 13.9	2138	14.2 - 152.8	10.3

We recommend consulting with a qualified electrician for design and installation of your DITRA-HEAT system on a 208 V power source. Keep in mind during design of the system that the DITRA-HEAT-E thermostats have an electrical current limit of 15 A.

SPACE HEATING

Discussion on use of Schluter®-DITRA-HEAT for space heating

DITRA-HEAT is intended to warm tile floors and make them more comfortable underfoot but can also contribute to space heating. Floor warming is a type of radiant heating that provides heat differently than from a forced air heating system, or from a baseboard heater or wall convector. As the tile covering warms up, it will radiate heat to the surrounding objects in the room, which can increase the comfort level of the occupants.

What determines comfort?
Ambient temperature alone does not determine human comfort. This is already clear when one considers the outdoor environment. For example, meteorologists will report the impacts of wind on perceived temperature in cold weather or humidity on perceived temperature in hot weather. We've all experienced the effect of sun exposure in regard to perceived temperature as well. Sitting in the shade will feel cooler than sitting in the sun, despite the ambient temperature being the same. This phenomenon applies to the interior environment as well.

How does radiant heating contribute to comfort?
In the interior environment, occupant comfort is primarily based on air temperature and the temperature of surrounding surfaces. Warmer surfaces, such as a floor that incorporates heating elements, emit heat in the form of infrared radiation. This radiant heat does not directly warm the air, but warms the surrounding objects and occupants, similar to the sun. Increases in air temperature result indirectly from convective heat from the warm objects. The temperature effect on the occupant is referred to as the "mean radiant temperature". "Operative temperature" is the average of air temperature and mean radiant temperature and is what most directly determines the comfort of the occupant. Therefore, when radiant heating is present, occupants can feel the same level of comfort at lower air temperatures.

Can I rely on DITRA-HEAT as the only heating source in my bathroom, kitchen, or living space?
In some cases the answer is yes. However, the amount of heat required to achieve a comfortable room depends on many variables that affect ambient temperature and mean radiant temperature, including but not limited to the following.

- Starting temperature and target temperature
- Outdoor temperature and desired indoor temperature
- Heat loss through walls, windows, and doors according to size and R-value of the components
- Size of room and height of the ceiling
- Total heated surface area

All of these variables must be considered to calculate the required heat output of the system and determine if it can meet the needs of the owner. Schluter-Systems does not perform heating load calculations as a service and can't make a final recommendation on the owner's heating system requirements. It is recommended that an HVAC professional be consulted to perform such an analysis and design. However, Schluter-Systems offers the following information to aid in the process and support the successful use of the DITRA-HEAT system.

The following notes are based on information gathered from articles and design guidebooks published by ASHRAE and other professional heating and cooling associations. They are intended to help support successful use of the DITRA-HEAT system to enhance or provide space heating comfort. They do not represent all variables or best practices that the heating professional must consider.

1. Operative temperature is what most directly determines the comfort of the occupant.
2. Operative temperature is calculated as the average of air temperature and mean radiant temperature.
3. Total heat output of the floor warming system to the space is proportional to the temperature differential between the floor surface and the operative temperature.
4. The ideal operative temperature for occupants is typically between 68°F to 75°F *(20°C to 24°C)*, depending on the level of activity, and for most situations, it is 72°F (22°C).
5. The air temperature will typically be controlled at approximately 2°F to 3°F *(1°C to 1.5°C)* lower when the floor warming system is in use at optimum conditions.
6. The recommended floor surface temperature is 84°F *(29°C)* or lower for comfort.

The heat output from the DITRA-HEAT system can be calculated using the recognized equation from various major heating and cooling engineering associations. This equation takes into account the contribution from radiant heat and convective heat.

$Q = 8.92\Delta T^{1.1}$, *where Q is in units of* W/m^2 *and* ΔT *is in units of °C*

ΔT*	Total heat Output	
°F	(W/ft²)	(Btu/hr/ft²)
2	0.9	3.2
4	2.0	6.8
6	3.1	10.6
8	4.3	14.6
10	5.5	18.6
12	6.7	22.8
14	7.9	27.0
16	9.2	31.3
18	10.4	35.6
20	11.7	40.0

ΔT*	Total heat Output	
°C	(W/m²)	(Btu/hr/m²)
1	8.9	30.4
2	19.1	65.2
3	29.9	101
4	41.0	140
5	52.4	179
6	64.0	218
7	75.9	259
8	87.9	300
9	100	341
10	112	383

*ΔT = Temperature Differential between Floor Surface and Operative Temperature

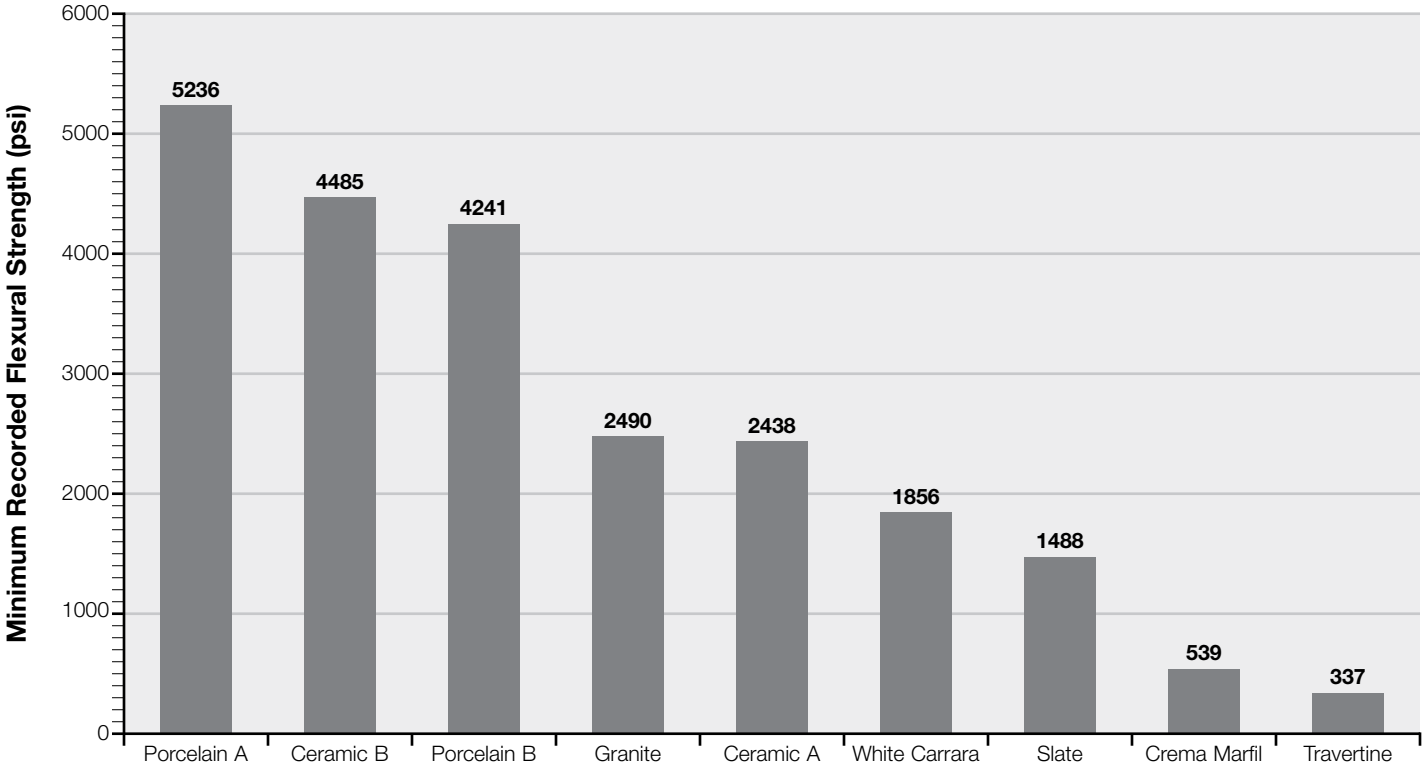
For example, in a typical situation where the floor surface temperature is 82°F and the operative temperature is 72°F, the differential is 10°F, so the total heat output from the floor surface is 5.5 W/ft² or 18.6 Btu/hr/ft².

NATURAL STONE

Discussion of natural stone and single-layer wood subfloors

Natural stone is a product of nature with a wide variety of colors, patterns, and textures that come together to distinguish it as one of the premiere surface coverings available on the market. Some of stone's characteristics, which add to its beauty and uniqueness, are veins, fissures, starts, and dry-seams. While these characteristics enhance its aesthetic appeal, they're also indicators that point to the inherent variability of the flexural strength of natural stone, which can have detrimental effects on serviceability. This variability is underscored by examining the range of typical flexural (bending) strengths of ceramic tile compared to the range of strength for some common natural stones.

Schluter-Systems contracted the Tile Council of North America (TCNA) to perform flexural strength testing on various commercially available ceramic tiles and dimension stones guided by the ASTM C880 Standard Test Method for Flexural Strength of Dimension Stone. Five samples of each tile and stone were tested, with the minimum recorded values displayed in the figure below. We have chosen to show only minimum values since these represent the weakest samples, which would be most prone to cracking in service over a bending substrate.



It is clear from the figure that the minimum recorded flexural strengths of these dimension stones tend to be significantly less than those of the ceramic tiles. In some cases, the differences are dramatic. For example, the minimum recorded flexural strength of the weakest travertine sample (337 psi) was only 14% of the minimum flexural strength of the weakest ceramic sample (2438 psi). In other words, the weakest ceramic sample was more than 7 times as strong as the weakest travertine sample. As another example, the minimum recorded flexural strength of the weakest porcelain sample is more than 12 times as strong as the minimum recorded flexural strength of the weakest travertine sample.

Q. Why does Schluter-Systems require a double-layer wood floor for installing natural stone over DITRA-HEAT and DITRA-HEAT-DUO?

A. There are three principle reasons: 1) As illustrated above, the fact that most stone products have a minimum flexural strength that is substantially lower than what is typical for ceramic tile; 2) Stones are products of nature and complex heterogeneous materials with naturally occurring regions of discontinuity, such as veins and fissures. Such features can be weaker than the surrounding stone fabric and act as "stress risers," concentrating bending stresses within the region of discontinuity; and 3) When wood floor assemblies are subjected to forces such as loading – both live and dead loads – they produce flexural stresses in the surface covering which can cause weak and brittle materials to break or crack.

Engineering mechanics as well as field observations show that the location of maximum flexural stresses in the floor assembly is directly over the floor joists and at seams in the subfloor panels. Therefore, we recommend double-layer wood floors when installing natural stone in order to increase the stiffness of the sheathing assembly and position underlayment seams away from the joists to minimize flexural stresses in the stone covering directly above the joists and at seams. Refer to page 17 for underlayment installation guidelines. For more information on the development of these guidelines, please refer to the article titled "Position of Underlayment to Prevent Cracked Tile and Grout" on our website at https://www.schluter.com/schluter-us/en_US/articles.

To avoid damaging the Schluter®-DITRA-HEAT-E-HK heating cable spool due to handling, we recommend turning the box over to remove the spool from the packaging box. Then pick up the spool from underneath the heating cable coil, but not by the cardboard washers.

Heating Cable Tests

The following table outlines DITRA-HEAT system warranty coverage based on which heating cable tests are conducted, documented, and submitted to Schluter. Please refer to the Heating Cable Tests Log on page 39 of this Handbook and Warranty on page 40 of this Handbook for further information.

Tests Conducted	Term	Resolution
Test 1: Conductor Resistance + **Test 2:** Continuity between Conductor and Ground Braid + **Test 3:** Insulation Resistance + **Test 4:** Floor Temperature Sensor	15 years	Assembly repair or replacement (labor & materials)
Test 1: Conductor Resistance + **Test 2:** Continuity between Conductor and Ground Braid + **Test 4:** Floor Temperature Sensor	10 years	Assembly repair or replacement (labor & materials)
No Heating Cable Testing Conducted		**No heating cable warranty coverage;** Only 10 year warranty coverage on the DITRA-HEAT/-PS or DITRA-HEAT-DUO/-PS membrane.
Testing Notes: • Prior to testing and installation, it is recommended to acclimate the heating cables and the testing meter to room temperature. Refer to the meter user manual for guidance. • For Test 1: Conductor resistance, if you receive an OL reading, set your meter to a different scale (i.e., kohm) and retest.		

Test 1: Conductor resistance (required)

In order to perform the resistance test, you must set your multimeter for resistance measurement and take an ohms reading between the two power leads. If the ohms reading taken on the two power leads varies significantly (10% or more) from the value printed on the spool, it either means that the cable has been damaged, or that the measuring instrument is not set properly, or that it is simply out of calibration. The ohms measurement must be recorded in your heating cable tests log (page 39).

Test 2: Conductor and ground braid continuity (required)

The heating cable is protected by a ground braid. An electrical insulator prevents any contact between the braid and the two conductors. To make sure there is no contact between the braid and the two conductors, you must perform a continuity test. Using the continuity test (buzzer logo) function of your multimeter, test your cable between the braid and one of the two power leads. If there is no continuity (if the test is successful), the multimeter will typically display, depending on the instrument used, either “OL ” for “over load” or “I” for “infinity” or a greater than reading. Otherwise, if the test fails, a value will typically be displayed and a warning tone will typically be heard. Repeat the test with the second power lead. The test results must be recorded in your heating cable tests log (page 39).

Test 3: Insulation resistance (recommended)

This test is meant to detect very small breaks throughout the cable insulation. These breaks often remain undetected during the continuity test since they are not necessarily short circuits between the conductor and the ground braid. Even though they are small, these breaks are likely to cause a current leakage to ground. Such a leakage is usually detected by the mandatory ground-fault circuit interrupter “GFCI” (thermostat with integrated GFCI or panel mount GFCI). When a current leakage is detected, the GFCI trips the circuit, thus disabling the floor heating system. In order to perform the insulation resistance test, you must, using a megohmmeter (Mohm logo), take an insulation measurement between the braid and one of the two power leads. Make sure the megohmmeter range is set at 1000 V. The insulation resistance measurement must be equal to or greater than 1 Gigaohms (1 Gigaohms = 1 G ohms = 1000 M ohms = 1000 Mega ohms). Repeat the test with the second power lead. The insulation resistance measurements must be recorded in your heating cable tests log (page 39).

Test 4: DITRA-HEAT Floor Temperature Sensor Test (required)

Test the floor temperature sensors using a multimeter to verify accuracy of the sensors. Set the multimeter to the resistance setting (i.e., Ω or 20K Ω +/-2, as applicable) at room temperature and take a reading between the sensor leads. The resistance will vary according to the temperature (i.e., the colder the sensor, the higher the resistance). Compare values with the table of expected values from the heating cable tests log on page 39 and record the result.

HEATING CABLE TESTS LOG

Validation for warranty coverage

Each heating cable is subject to factory quality control. However, damage to the cables may happen after the product leaves the factory. In order to ensure that the cable quality remains unchanged throughout the installation process and for warranty purposes, tests must be conducted while the cable is still on the spool and during two specific subsequent steps. Measurements must be recorded in the table below and compared to initial measurements taken when the cable was on the spool in order to enable you to detect any changes related to the electrical property of the cable. Any installation-related cable damages are not covered by the warranty. See page 38 for complete heating cable testing instructions.

The DITRA-HEAT system has warranty coverage up to a period of fifteen (15) years. In order to receive warranty coverage, the owner must complete and submit the warranty registration card and completed heating cable tests log to Schluter-Systems online at https://www.schluter.com/schluter-us/en-US/registerwarranty or via mail at the address provided hereafter within fourteen (14) days of installation. It is an installation requirement that the heating cable tests log be completed by the installer at the time of installation with a copy submitted to Schluter-Systems; it is recommended that the owner retain the original logs. The heating cable tests log must include results for the following tests: "Test 1: Conductor Resistance," "Test 2: Conductor and Ground Braid Continuity," "Test 3: Insulation Resistance," and "Test 4: Floor Temperature Sensors Test." **Failure to conduct these tests and submit the heating cable tests log will reduce or may void coverage under this Limited Warranty.**

In the event the heating cable tests log only includes the results for "Test 1: Conductor Resistance," "Test 2: Conductor and Ground Braid Continuity," and "Test 4: Floor Temperature Sensors Test," but does not include results for "Test 3: Insulation Resistance," the applicable warranty term shall be ten (10) years from the date of purchase. If the heating cable tests log does not include test results for "Test 1: Conductor Resistance," "Test 2: Conductor and Ground Braid Continuity," and "Test 4: Floor Temperature Sensors Test," such installation does not qualify for coverage under this Limited Warranty.

Completion of warranty registration qualifies customers for the system warranty, in which Schluter-Systems shall a) reinstall or replace the failed portion of the floor covering assembly or b) pay an amount not to exceed the original square foot cost of the installation of the floor covering assembly verified to be defective.

The owner must retain a copy of this heating cable tests log for warranty purposes.

Heating Cable Tests Log

Location/Homeowner: _____ **Date of installation:** _____

Qualified person: _____ **Date put into service*:** _____

Identification	Factory Value		Before Installation	After Cable Installation	After Tile Installation
Test 1: Conductor Resistance Test Readings must fall within - or + 10% of the factory value printed on the silver heating cable identification tag.					
Test 2: Conductor and Ground Braid Continuity Test					
	Infinity (I) or Overload (OL)				
Test 3: Insulation Resistance Test					
	Equal to or greater than 1 Gigaohms**				
Test 4: Floor Temperature Sensor Test					
	Temperature		**Resistance**		
	°C	**°F**	**Kohms**		
	10	50	19.9		
	15	59	15.7		
	20	68	12.5		
	25	77	10.0		
	30	86	8.0		

* Allow the assembly to cure for 7 days after grouting before putting the floor warming into service. For natural stone applications, extended curing times after grouting are recommended.
**1 Gigaohms = 1 G ohms = 1000 M ohms = 1000 Mega ohms

WARRANTY

Schluter-Systems products and systems are covered under our warranty program, as applicable. For details and to access Schluter Systems' warranty documents:

Visit www.schluter.com/warranties

Or scan here

To obtain hard copies, please contact Customer Service at: 800-472-4588 (USA) or 800-667-8746 (Canada).

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System warranty!

Labor and materials are covered when Schluter heating cables are installed with DITRA-HEAT.

For complete warranty information, visit schluter.com/warranties

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