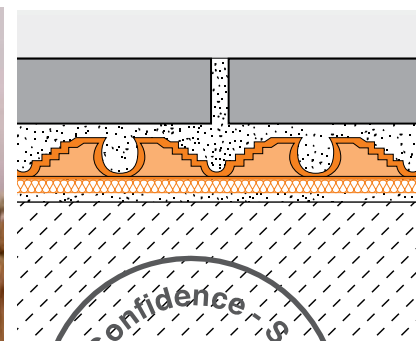
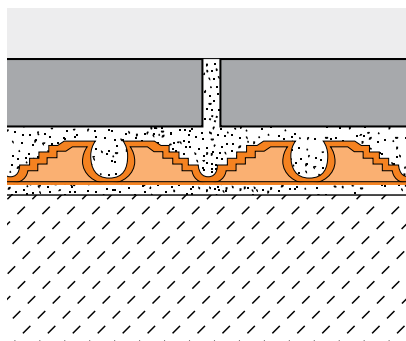
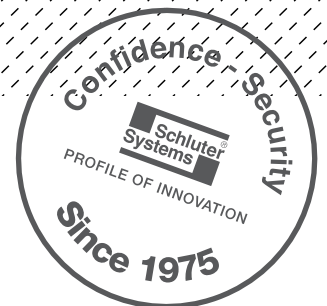


Schluter®-DITRA-HEAT Installation Handbook 2020



Electric Floor Warming System
with Integrated Uncoupling Technology



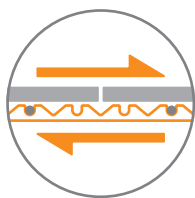
Schluter®-DITRA-HEAT

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, significantly reducing installation time and effort compared to uncoupling membranes over other electric floor warming systems.



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.



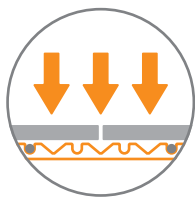
Waterproofing

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.

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Heating cables must be installed by a qualified person in accordance with this handbook and with the National Electric Code (USA) or Canadian Electric Code Part I (CAN) as applicable. All electrical connections must be made by a qualified electrician, 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 **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.

Floors, Interior - Ceramic or Porcelain Tile

DH-W16-T-20

Ceramic or porcelain tile

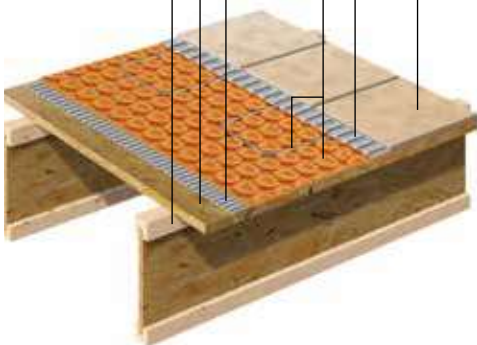
Schluter **SET**®, Schluter **ALL-SET**®, Schluter **FAST-SET**®, or unmodified thin-set mortar

DITRA-HEAT or **DITRA-HEAT-DUO** uncoupling membrane and heating cables

Schluter **ALL-SET**®, Schluter **FAST-SET**®, or modified thin-set mortar

Single layer of plywood or OSB

Joists, I-joists, or trusses



★★★



★★★



★



★★

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 35)

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 and DITRA-HEAT-DUO.

Movement Joints

- ▲ DITRA-HEAT and DITRA-HEAT-DUO 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 13 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 and DITRA-HEAT-DUO.
- ▲ vapor barrier on crawl space floors according to regional building codes.
- ▲ where a waterproof floor is required, all DITRA-HEAT and DITRA-HEAT-DUO seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter **SET**®, Schluter **ALL-SET**®, Schluter **FAST-SET**®, or unmodified thin-set mortar; see page 12.

DH-W19-T-20

Ceramic or porcelain tile

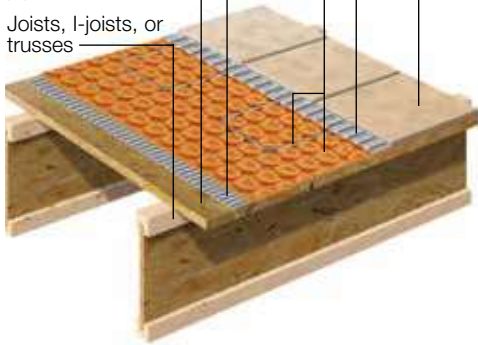
Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET®, or unmodified thin-set mortar

DITRA-HEAT or DITRA-HEAT-DUO uncoupling membrane and heating cables

Schluter ALL-SET®, Schluter FAST-SET®, or modified thin-set mortar

Single layer of plywood or OSB

Joists, I-joists, or trusses



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 35)

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 and DITRA-HEAT-DUO.

Movement Joints

- ▲ DITRA-HEAT and DITRA-HEAT-DUO 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 13 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 and DITRA-HEAT-DUO.
- ▲ vapor barrier on crawl space floors according to regional building codes.
- ▲ where a waterproof floor is required, all DITRA-HEAT and DITRA-HEAT-DUO seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET®, or unmodified thin-set mortar; see page 12.

DH-W24-T-20

Ceramic or porcelain tile

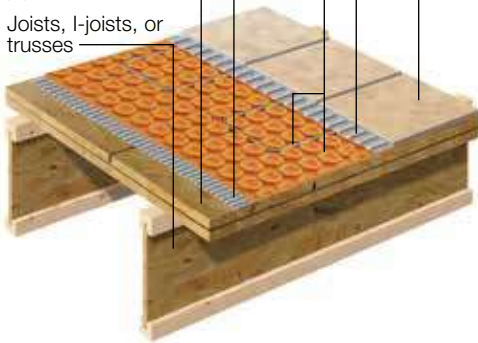
Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET®, or unmodified thin-set mortar

DITRA-HEAT or DITRA-HEAT-DUO uncoupling membrane and heating cables

Schluter ALL-SET®, Schluter FAST-SET®, or modified thin-set mortar

Double layer of plywood or OSB

Joists, I-joists, or trusses



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 16 for underlayment installation guidelines.
- ▲ any leveling of the subfloor must be done prior to installing DITRA-HEAT and DITRA-HEAT-DUO.

Movement Joints

- ▲ DITRA-HEAT and DITRA-HEAT-DUO 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 13 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

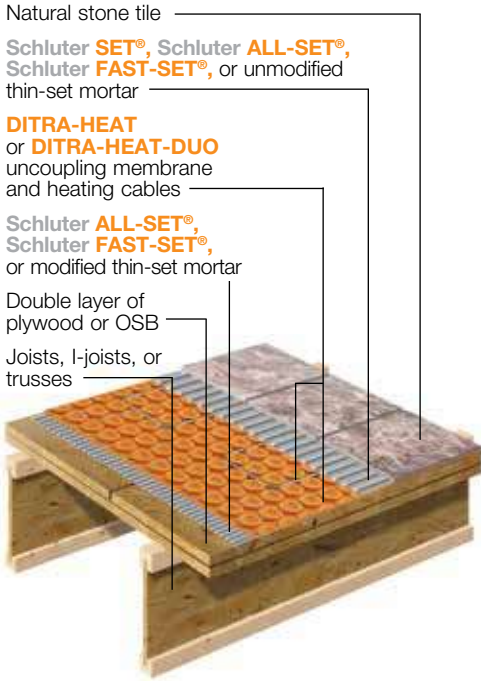
Setting and Grouting Specifications

- ▲ 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 and DITRA-HEAT-DUO.
- ▲ vapor barrier on crawl space floors according to regional building codes.
- ▲ where a waterproof floor is required, all DITRA-HEAT and DITRA-HEAT-DUO seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET®, or unmodified thin-set mortar; see page 12.

DH-W-S-20



Natural stone tile

Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET®, or unmodified thin-set mortar

DITRA-HEAT or DITRA-HEAT-DUO uncoupling membrane and heating cables

Schluter ALL-SET®, Schluter FAST-SET®, or modified thin-set mortar

Double layer of plywood or OSB

Joists, I-joists, or trusses



Double layer of 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

- ▲ 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 16 for underlayment installation guidelines.
- ▲ any leveling of the subfloor must be done prior to installing DITRA-HEAT and DITRA-HEAT-DUO.

Movement Joints

- ▲ DITRA-HEAT and DITRA-HEAT-DUO 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 13 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

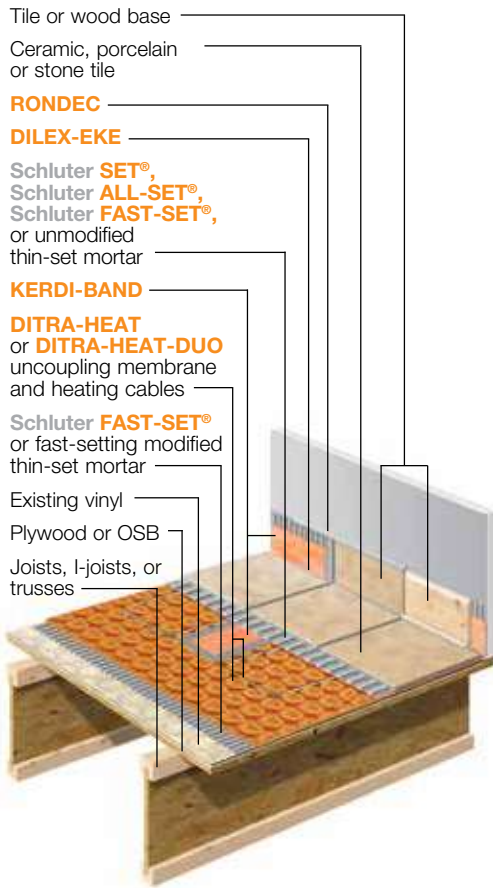
Setting and Grouting Specifications

- ▲ tile – ANSI A108.5
- ▲ grout – ANSI A108.6, A108.9, A108.10

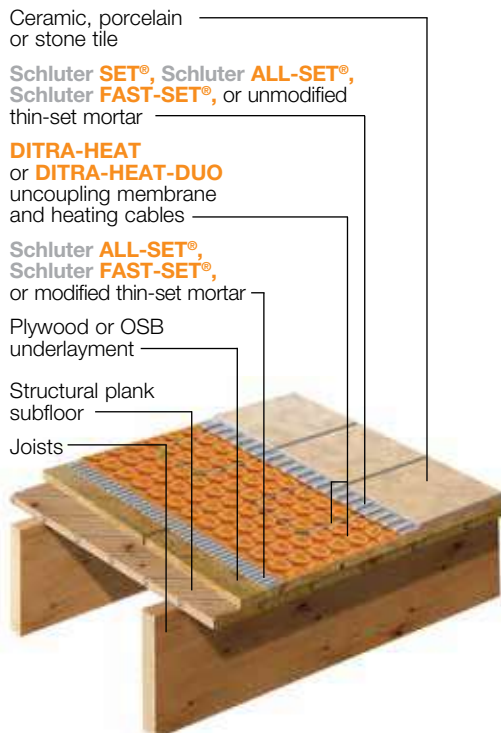
Other Considerations

- ▲ 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 and DITRA-HEAT-DUO.
- ▲ vapor barrier on crawl space floors according to regional building codes.
- ▲ where a waterproof floor is required, all DITRA-HEAT and DITRA-HEAT-DUO seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET®, or unmodified thin-set mortar; see page 12.

DH-V-T-20



DH-SP-TS-20



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

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 and DITRA-HEAT-DUO.

Movement Joints

- ▲ DITRA-HEAT and DITRA-HEAT-DUO 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 13 of this Handbook, TCNA EJ171, and TTMAC 301 MJ.

Setting and Grouting Materials

- ▲ Fast-setting modified thin-set mortar - ANSI A118.4 or ANSI A118.15
- ▲ 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 and DITRA-HEAT-DUO 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 and DITRA-HEAT-DUO are adhered to the skim coat using Schluter SET® or unmodified thin-set mortar. See page 25 for discussion on latex-modified thin-set mortars sandwiched between two impervious layers.
- ▲ seaming DITRA-HEAT and DITRA-HEAT-DUO, 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 12.
- ▲ 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 16 for underlayment installation guidelines.
- ▲ any leveling of the subfloor must be done prior to installing DITRA-HEAT and DITRA-HEAT-DUO.

Movement Joints

- ▲ DITRA-HEAT and DITRA-HEAT-DUO 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 13 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 and DITRA-HEAT-DUO seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET®, or unmodified thin-set mortar; see page 12.
- ▲ 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 **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. 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.

Floors, Interior - Ceramic or Stone Tile

DH-C-TS-20

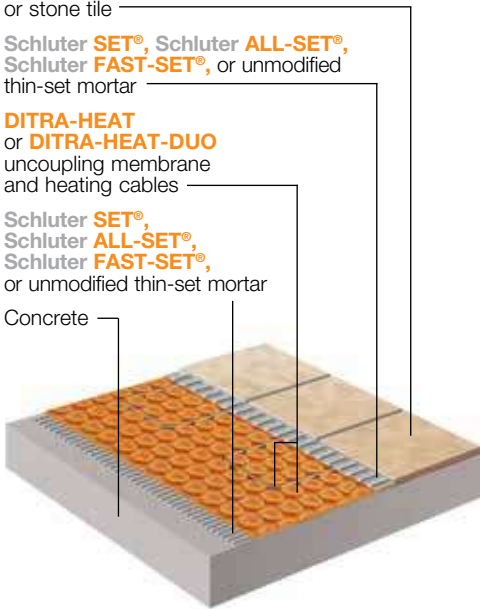
Ceramic, porcelain
or stone tile

Schluter **SET**®, Schluter **ALL-SET**®,
Schluter **FAST-SET**®, or unmodified
thin-set mortar

DITRA-HEAT
or **DITRA-HEAT-DUO**
uncoupling membrane
and heating cables

Schluter **SET**®,
Schluter **ALL-SET**®,
Schluter **FAST-SET**®,
or unmodified thin-set mortar

Concrete



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 and DITRA-HEAT-DUO sealed with KERDI-BAND using unmodified thin-set mortar
- ▲ any cracks in concrete subfloor must exhibit in-plane movement only; thin-set tile assemblies, including those incorporating DITRA-HEAT or DITRA-HEAT-DUO, 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 or DITRA-HEAT-DUO and tile can begin as soon as the slab can be walked upon
- ▲ 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 and DITRA-HEAT-DUO

Movement Joints

- ▲ DITRA-HEAT and DITRA-HEAT-DUO 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 13 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 and DITRA-HEAT-DUO seams and floor/wall transitions must be sealed with KERDI-BAND using unmodified thin-set mortar; see page 12.
- ▲ 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 to improve the response time of DITRA-HEAT in applications over concrete. See page 31 for more information.

GYPSUM

Every substrate presents unique challenges

Bonding ceramic or stone tiles directly to gypsum concrete 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 concrete 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 concrete is used as a thermal mass for radiant heated floors. With the increasing popularity of radiant heated floors, which typically utilize gypsum concrete, tile installers need a reliable installation system to address these issues.



The uncoupling function of **DITRA-HEAT** protects the ceramic or stone tile covering by neutralizing the differential movement stresses between the gypsum concrete 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 concrete underlayments, 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. **DITRA-HEAT** is useful even in applications where hydronic radiant-heating tubes are incorporated in gypsum concrete, as there may be times when floor warming is desirable while radiant heating is not necessary.

Floors, Interior - Ceramic or Stone Tile

Gypsum concrete

DH-G-TS-20

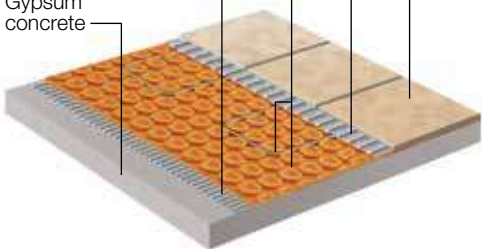
Ceramic, porcelain or stone tile

Schluter **SET**®, Schluter **ALL-SET**®, Schluter **FAST-SET**®, or unmodified thin-set mortar

DITRA-HEAT or **DITRA-HEAT-DUO** uncoupling membrane and heating cables

Schluter **SET**®, Schluter **ALL-SET**®, Schluter **FAST-SET**®, or unmodified thin-set mortar

Gypsum concrete



★★★★



★★★★



★★★★



★★★

Areas of Application

- ▲ over gypsum concrete 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** not recommended over heated floors

Requirements

- ▲ for wood substrates, subfloor/underlayment configuration according to detail DH-W16-T, DH-W-20-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** and **DITRA-HEAT-DUO**.

Substrate preparation

- ▲ gypsum – follow manufacturer's directions

Movement Joints

- ▲ **DITRA-HEAT** and **DITRA-HEAT-DUO** 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 13 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

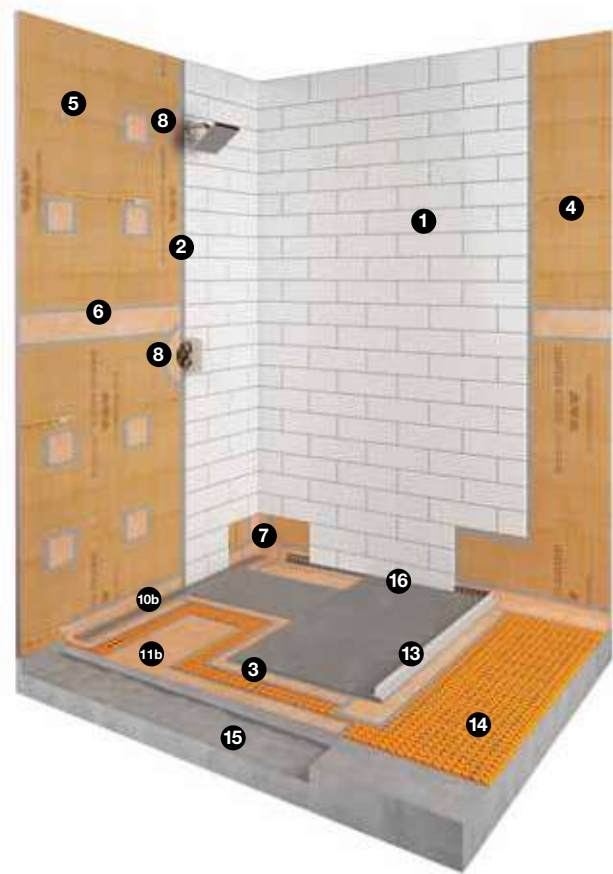
- ▲ since **DITRA-HEAT** and **DITRA-HEAT-DUO** must bond to the gypsum concrete, follow gypsum manufacturer's directions regarding primers and/or special surface preparation before installing **DITRA-HEAT** and **DITRA-HEAT-DUO**.
- ▲ where a waterproof floor is required, all **DITRA-HEAT** and **DITRA-HEAT-DUO** seams and floor/wall transitions must be sealed with **KERDI-BAND** using Schluter **SET**®, Schluter **ALL-SET**®, Schluter **FAST-SET**®, or unmodified thin-set mortar; see page 12.
- ▲ 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.

SHOWER ASSEMBLY

Showers – Ceramic or stone tile

Schluter®-DITRA-HEAT Shower Application

DH-SH-20



- 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**
- 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** or Schluter®-**DITRA-HEAT-DUO** Electric floor warming and 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®-DITRA-HEAT Shower Application

DH-SH-20

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.

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.

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 underlayment, fiber-reinforced water-resistant gypsum backerboard/underlayment, coated glass mat water-resistant gypsum backerboard, Portland cement mortar bed, 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., 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-SR 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/-LINE shall be properly supported. Additional thin-set mortar may be needed to bed the KERDI-DRAIN for this detail.
- ▲ KERDI-DRAIN/-LINE 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 or DITRA-HEAT-DUO membrane. KERDI must be installed over the heating cables and DITRA-HEAT-DUO 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/LINE. 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. Multiple heating cables may be installed on a single thermostat, up to the 15 amp limit.
- ▲ Heating cables must be installed 3 studs from the edge of the KERDI-LINE flange and

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

2 studs from the edge of the KERDI-DRAIN flange.

Safety

- ▲ Repairs to the DITRA-HEAT heating cable in the shower may not be approved. Verify with the local inspector or authority having jurisdiction (AHJ). Flood testing the shower is recommended before re-tiling.
- ▲ Heating cable factory splice (i.e., cold lead splice) must not be installed in the shower area.

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/-SR, KERDI-BOARD-SC/-SB, DITRA-HEAT, and DITRA-HEAT-DUO membranes.

Solid Backing Materials

- ▲ Gypsum wallboard – ASTM C1396/C1396M
- ▲ Cementitious backer unit – ANSI A118.9 or ASTM C1325
- ▲ Fiber-cement underlayment – ASTM C1288
- ▲ Fiber-reinforced water-resistant gypsum backerboard/underlayment – 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.130-03. DITRA-HEAT membranes have been found to meet or exceed the requirements of ANSI A118.10.
- ▲ 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.
- ▲ Schluter®-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.
- ▲ Schluter®-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.

WATERPROOFING

Every substrate presents unique challenges

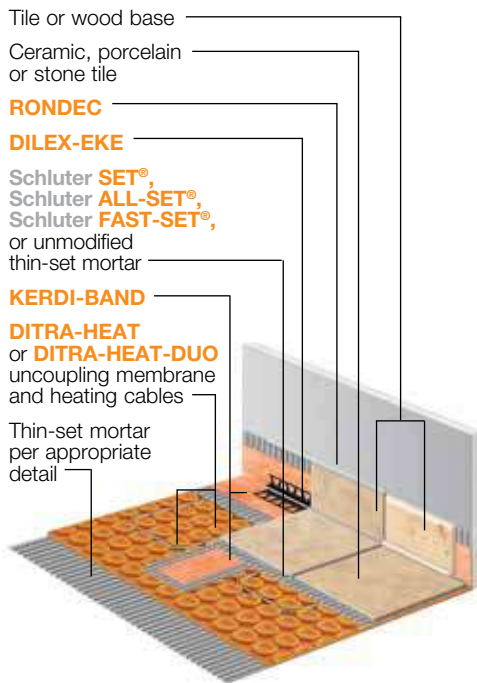
Today's construction methods, which include the use of lightweight, moisture-sensitive materials, such as plywood, OSB, and gypsum concrete, have made the installation of hard surface coverings particularly challenging. If wood or gypsum concrete substrates are exposed to moisture, the tile covering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

Floors, Interior - Ceramic or Stone Tile

DH-WP-20



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

Requirements

- ▲ all seams in DITRA-HEAT and DITRA-HEAT-DUO matting and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET®, Schluter ALL-SET®, Schluter 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 and DITRA-HEAT-DUO, 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.
- ▲ 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 or KERDI-LINE may be used to provide drainage in DITRA-HEAT and DITRA-HEAT-DUO applications. DITRA-HEAT and DITRA-HEAT-DUO are sealed to the fleece-laminated KERDI-DRAIN bonding flange with a section of KERDI membrane using Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET®, or unmodified thin-set mortar. KERDI-FIX is used to seal the section of KERDI to the stainless steel KERDI-DRAIN bonding flange. DITRA-HEAT and DITRA-HEAT-DUO are sealed to the KERDI waterproofing collar on KERDI-LINE using Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET®, or unmodified thin-set mortar.

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.

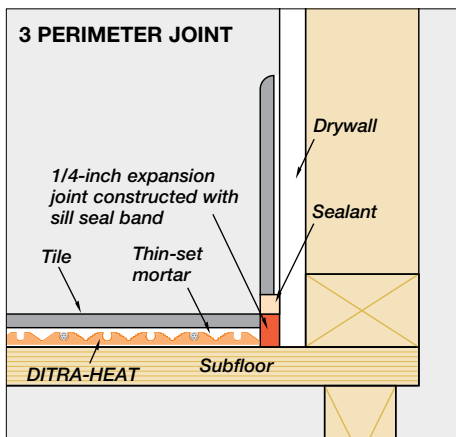
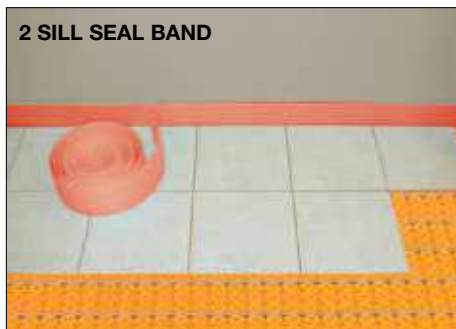
TECHNICAL NOTES

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

- ▲ 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' - 16' (3.7 m - 4.9 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



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 Schluter®-DILEX corner movement profiles will not be used, Schluter®-Systems recommends the use of 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 sill seal band is placed against perimeter structures before any component of the tile assembly is installed, (e.g., DITRA-HEAT, DITRA-HEAT-DUO, additional underlayments including self-leveling materials, mortar beds, etc. See figures 2 and 3). After the tile is installed and grouted, any excess 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 and DITRA-HEAT-DUO 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 and DITRA-HEAT-DUO 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 and DITRA-HEAT-DUO 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.

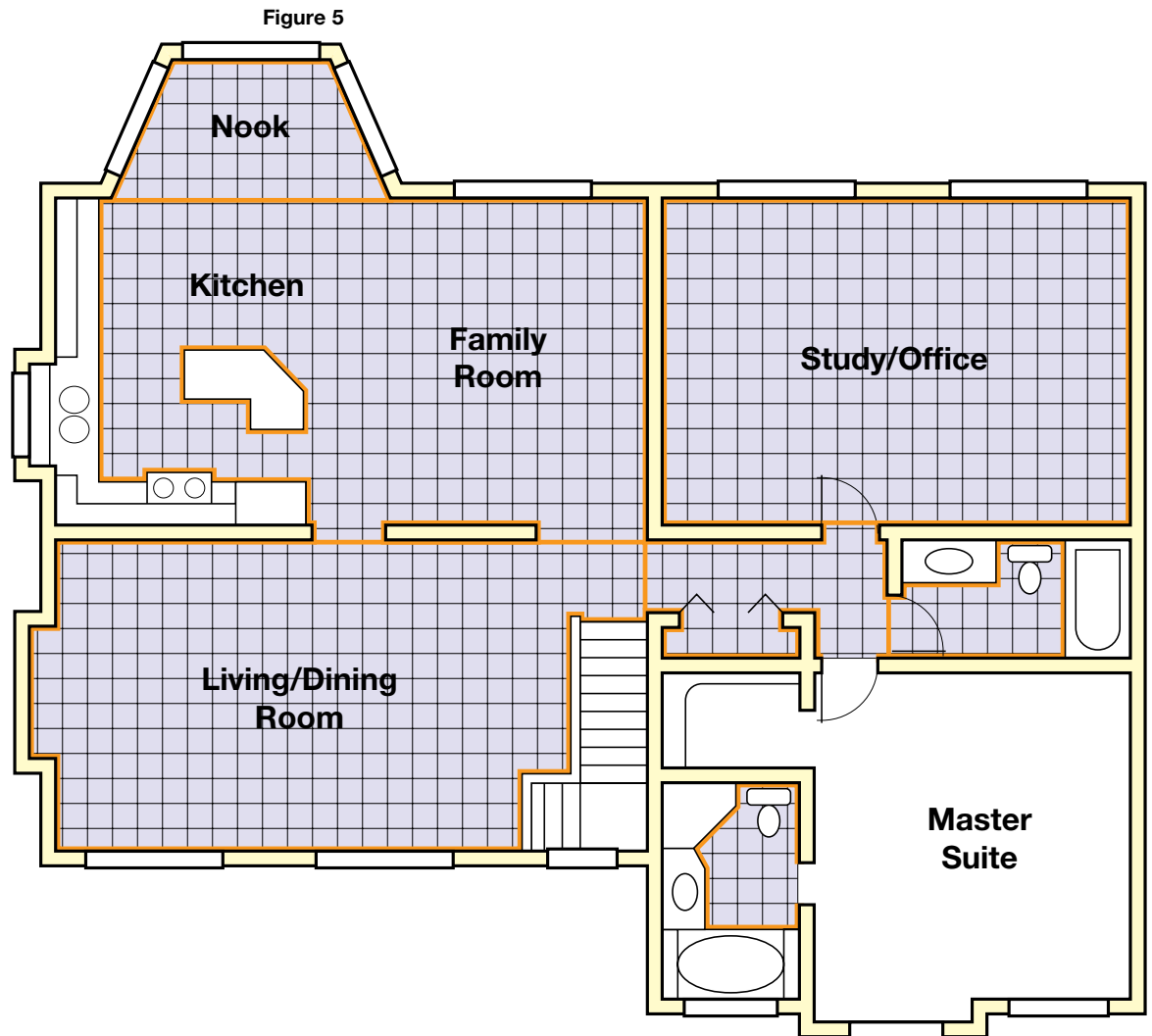
Structural or Seismic Joints

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.



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. About 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 2

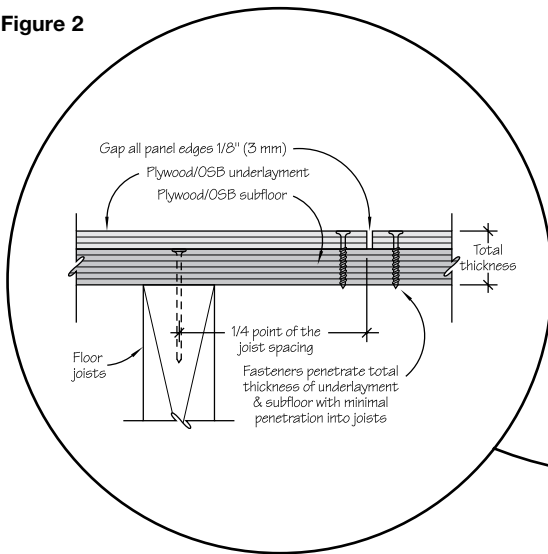
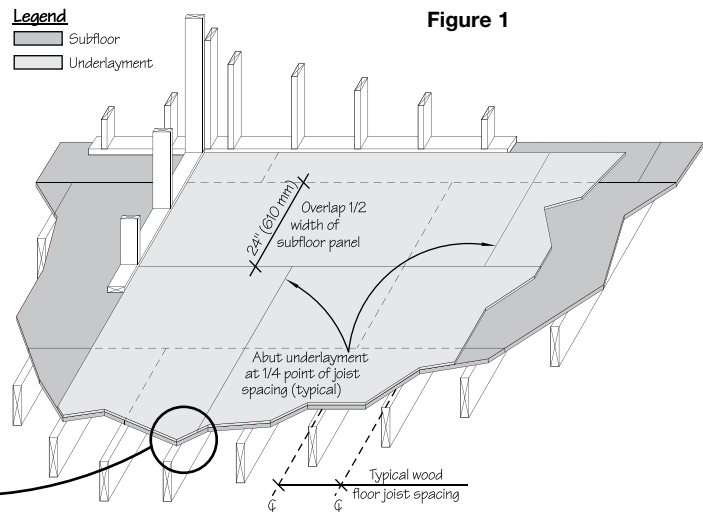


Figure 1



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, 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 Schluter®-DITRA-HEAT and Schluter®-DITRA-HEAT-DUO membranes and Schluter®-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 Schluter®-DITRA-HEAT Installation Handbook to help ensure a successful installation. Table 1 below lists the various types of alternative floor coverings tested.

The Schluter 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)	(°F)	(°C)
	(in)	(mm)				
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/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	10 – 15	0.25	6	77 – 76	25 – 24.5
	5/8 – 3/4	16 – 19	0.31	8	75	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

Schluter®-DITRA-HEAT is suitable for applications with engineered wood, vinyl, 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.** This can be done manually or by selecting "Laminate Flooring" in the "Floor Protection" section of the "Installer Settings" menu of any of the Schluter®-DITRA-HEAT-E thermostats.
- ▲ 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. Please refer to detail DH-AFC and the Schluter®-DITRA-HEAT Installation Handbook for complete installation guidelines.

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 or DITRA-HEAT DUO membrane using thin-set mortar.
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**.
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. **The thermostat must be set to "Laminate Flooring" in the "Floor Protection" section, and to "Floor" in the "Sensor Application" section, both in the "Installer Settings" menu.** The set point temperature of the thermostat must remain at 82°F (28°C) or below at all times, unless the floor covering is a 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.

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

DH-AFC-20

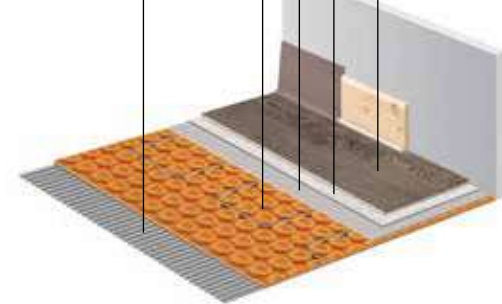
Engineered Wood, Vinyl, WPC, LVT/LVP, SPC, and Laminate

Floor covering adhesive or foam underlayment, if required, per manufacturer

Cementitious self-leveling underlayment

DITRA-HEAT or **DITRA-HEAT-DUO** uncoupling membrane and heating cables

Thin-set mortar per appropriate detail



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 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 and DITRA-HEAT-DUO

Movement Joints

- ▲ DITRA-HEAT and DITRA-HEAT-DUO 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 and DITRA-HEAT-DUO seams and floor/wall transitions must be sealed with KERDI-BAND using Schluter SET®, Schluter ALL-SET®, Schluter 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

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 and DITRA-HEAT-DUO membrane according to the size of the area to be tiled.
- Select DITRA-HEAT-E-HK heating cable(s) according to the size of the area to be heated and the cable spacing in the DITRA-HEAT membranes (See table entitled HEATING CABLE SPECIFICATION on page 26 for more details):
 - Cable spaced at 3 studs apart is standard
 - Cable may also be spaced at continuously alternating 3 stud - 2 stud intervals in isolated areas or over the entire floor. This practice may be desirable to increase heat output (e.g., over uninsulated on or below grade concrete subfloors) or to consume more cable length in a given area (e.g., when using the standard 3 stud spacing doesn't allow the selected cable to fit the floor area and respect minimum spacing requirements from walls, partitions, etc.)
 - Cable spacing of 4 studs is not recommended, as it can produce inconsistent floor surface temperatures
 - For alternative floor coverings (other than ceramic, porcelain and stone tiles) please refer to section entitled "Alternative Floor Coverings" on page 17 for details
- When measuring the area to be heated, be sure to measure accurately. The heating cable CANNOT be cut to fit. The allowable heated area is limited by the minimum required spacing from fixed elements such as:
 - Walls, partitions, and fixed cabinets = 2" (50 mm)
 - Heat sources (baseboard heaters or other fixed heating devices, fireplaces, etc.) = 8" (200 mm)
 - Forced air heating vents = 4" (100 mm)
 - Centerline of toilet drains = 7" (180 mm)
 - Drain pipe = 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.
- It is helpful to plan the location of a buffer zone, as it is not possible to predict exactly where the heating cable will end. The buffer zone is an area where floor warming 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.
- In the case where there is no space left in the buffer zone(s) and there is excess cable, a continuously alternating 3 stud and 2 stud spacing (i.e. 3-2-3-2) between cable runs may be used. The following must be maintained:
 - The minimum spacing from fixed elements mentioned above
 - Do NOT install heating cable with a repeating 2 stud spacing or narrower spacing anywhere on the floor
 - Not following the above limitations may cause cable overheating and cable malfunctionNote: The areas with 3-2-3 will be noticeably warmer in some cases and the installer should discuss the location of this with the homeowner.
- For more information on installing DITRA-HEAT-E-HK heating cables on 208 V circuits, please see page 33.
- 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 pigtailed 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 power modules.

Preparation

- The substrate must be clean, even, and load bearing. Any leveling of the subfloor must be done prior to installing DITRA-HEAT and DITRA-HEAT-DUO.
- 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 and DITRA-HEAT-DUO. If a plywood/OSB underlayment is to be installed, follow the Wood Underlayment guidelines on page 16.
- 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 and DITRA-HEAT-DUO. Follow gypsum manufacturer's directions for additional substrate preparation.

Membrane



- 1 Using a thin-set mortar that is suitable for the substrate, apply the thin-set mortar (mixed to a fairly fluid consistency, but still able to hold a notch) using the DITRA-HEAT trowel, or other 1/4" x 1/4" (6 mm x 6 mm) 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).

Heating Cables Installation

Warning 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 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 Electric Code Part I (Canada) or the National Electric 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.**
- De-energize all power circuits before installation and servicing.
- 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.
- A Class A (5 mA) ground fault circuit interrupter (GFCI) is required for each circuit. The DITRA-HEAT-E thermostats include a GFCI, thus a GFCI circuit breaker is not required when using these thermostats.
- NEVER install a cable designed for a 120 V power source on a 240/208 V power source.
- The heating cable ground braid must be bonded to ground.
- For installations requiring a cold lead trim or splice, the electrical rating label shall be fixed to the cold lead and visible at the termination junction box. Removing the label will void the warranty.
- **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.
- 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
- Heating cables shall not be altered in the field. If the installer or the user modifies the unit, he will be held responsible for any damage resulting from this modification, and the warranty and the product certification will be void.
- Heating cables may not touch, cross over, or overlap one another or itself.
- The heating section of the cable and the factory 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 a wall, or anywhere else, as this may cause overheating and system failure.
- 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 temperature sensors need to be threaded either inside the same conduit as the cold lead, or in a separate conduit.
- 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.).
- In the USA, according to Rule 424.38 (A) of the National Electrical Code 2017, 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). Also, please verify approval of your cable layout prior to setting tile. Additionally, installations of heating cables in dressing rooms or large walk-in closets are subject to approval by the local AHJ.
- In Canada, according to Rule 62-202 of the Canadian Electrical Code 2018, a thermostat or an applicable temperature control device is required for each enclosed area where a heating cable is installed. 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.
- 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 there is or could have various items on the floor. Excessive heat will build up in these confined spaces and may cause cable overheating.
- NEVER use the heating cable for any purpose other than for indoor floor warming as explained in this Handbook.
- 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) may not provide sufficient power to warm the floor to the desired temperature, and may cause inconsistent floor surface temperatures. Exception: a continuous 2 stud spacing is recommended when connecting a 240 V heating cable to a 208 V power supply. See page 33 for more information.
- 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 toilet drain is 7" (180 mm).
- The minimum spacing from 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.
- The maximum allowable straight length of a single run of heating cable is 10 ft (3 m); the cable must be turned and go in the other direction, or form u-shaped "jog" at this point as in Photo 5b on page 22. This is to take into account the expansion of the metallic hot conductors of the heating cable while heating.
- The minimum temperature at which the cable should be installed is 32° F (0° C).
- 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 energize the cable while it is on the spool. This would lead to overheating that could damage the cable.

Heating Cables Installation

- DITRA-HEAT is primarily intended to warm tile floors and make them more comfortable underfoot, but can contribute to space heating. See page 34 for space heating guidelines.
- 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.
- 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.
- Install the two thermostat floor temperature sensors within the tile assembly. Two floor temperature sensors are provided - one with the DITRA-HEAT thermostats and one 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. Connect only one to the thermostat and the other is a spare in case one is broken during overall installation. The floor temperature sensors need to be threaded either inside the same conduit as the cold lead, or in a separate conduit.
- 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.
- 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 or DITRA-HEAT-DUO matting or with the tile covering installation.



To avoid damaging the 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 36 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: Thermostat 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: Thermostat 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 or DITRA-HEAT-DUO membrane.



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 36).



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 display, depending on the instrument used, either "OL" for "over load" or "I" for "infinity". Otherwise, if the test fails, neither "OL", nor "I" will be displayed and a warning tone will be heard. The test result must be recorded in your heating cable tests log (page 36).



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). The insulation resistance measurement must be recorded in your heating cable tests log (page 36).



Test 4: DITRA-HEAT Thermostat 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 and record in the heating cable tests log on page 36.

Installation

Check to ensure the heating cable(s) purchased match the power supply (i.e., 120 V with 120 V or 240 V with 240 V, or 240 V with 208 V). Check to ensure you are not exceeding the 15 amp limit of the thermostat. Compare the purchased cable area to the floor area to be heated. Important: The cable area purchased should be as close to the heated area as possible, without going over. The heating cable CANNOT be trimmed or shortened to fit.

It is recommended that the installation of the DITRA-HEAT system is photographed (e.g., heating cable layout, floor temperature sensor placements, transition splice location, 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 36). 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 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., CM, CMG, CMR, CMP, CL2, CL3, CL2R, CL3R, CL2P, CL3P, FT1, FT4, or FT6).



- 3 Mark where the cold/hot splice will be placed, cut the DITRA-HEAT or DITRA-HEAT-DUO matting and subfloor (if needed to accommodate the thickness of the splice), and insert 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 remote 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, at a spacing determined in the **Planning** section on page 19. 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 supply. See page 33 for more information. A wider spacing (e.g., 4 studs) 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.



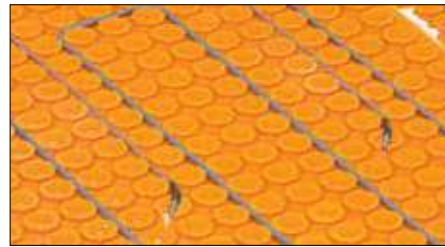
The maximum allowable length of a single run is 10 ft (3 m); the cable must be turned or a u-shaped "jog" created at this point (see image above).

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)
 - 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 sensors must be installed in the floor assembly. We recommend installing each of the thermostat 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 thermostat 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 17) are used, install temperature 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 36).

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 75 ft (23 m).

Extending the floor temperature sensor

The floor temperature sensor can be extended using an 18 AWG, 2-wire cable. The sensor wire itself is not made of building wire and therefore cannot pass through studs unless run through a conduit. We recommend twisting and soldering the wires and using electrical tape to insulate them. There is no maximum length that is recommended, 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 and DITRA-HEAT-DUO matting, be careful when applying the mortar to not damage the cable with the notched trowel.



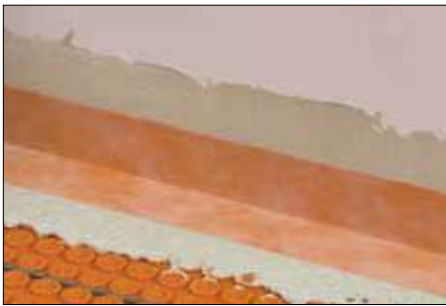
- 1 At the joints, fill the matting with Schluter SET®, Schluter ALL-SET®, Schluter FAST-SET®, or unmodified thin-set mortar, approximately 8" (203 mm) wide, centered over the joint.



- 2 Comb additional Schluter SET®, Schluter ALL-SET®, Schluter 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).

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

Tiles

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



- 1 Tile can be installed over DITRA-HEAT and DITRA-HEAT-DUO immediately; no need to wait for the mortar to cure. Fill the matting with Schluter SET®, Schluter ALL-SET®, Schluter 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, making 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.



- 4 Once the tile installation is complete, retest the heating cable and record values in the heating cable tests log (page 36).

Allow the assembly to cure for 7 days after grouting before putting the floor warming into service.

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).

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.

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: In general, we DON'T recommend it. Here's why:

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 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 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 conjunction with DITRA-HEAT and DITRA-HEAT-DUO.

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 and DITRA-HEAT-DUO uncoupling membranes in interior floor warming applications.

Item No.	Heating Cable Length		Area Covered per Cable Spacing				Total Power (W)	Avg. Power per Unit Area per Cable Spacing				Current (Amps)
			Regular 3 Stud		Alternating 3-2 Stud			Regular 3 Stud		Alternating 3-2 Stud		
	(ft)	(m)	(ft ²)	(m ²)	(ft ²)	(m ²)		(Watts/ft ²)	(Watts/m ²)	(Watts/ft ²)	(Watts/m ²)	
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 includes a floor temperature sensor compatible with the DITRA-HEAT-E thermostats and 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
TCNA-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.

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.

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
4	IN17_059	ASTM E492	6" Concrete	RSIC-1 clips with gypsum board	IIC = 60

*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 73°F (23°C) 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. 130-03 "Requirements for Electrical Resistance Heating Cables 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

DITRA-HEAT-E-WiFi thermostat WiFi radio chip authorized by the FCC (USA) and IC (Canada) under the following numbers:

FCC ID.....AZY-HF-LPT200

IC ID.....12243A-HFLPT2001

The DITRA-HEAT-E-RT/-R/-WiFi 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 E60730-1:13 "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 4th ed. "Ground-Fault Circuit Interrupters"
- CSA C22.2 No. 144.1-06 "Ground-Fault Circuit Interrupters"

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

Membrane

DITRA-HEAT:

- ICC-ES Report No. ESR-2467
- ICC-ES PMG Report No. PMG-1204
- U.S. Pat. No. 8,950,141, and U.S. DES. PAT. No. D706459
Canada © Schluter Systems L.P. and other patents pending

DITRA-HEAT-DUO:

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

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 Δ IIC (delta IIC), and measures the performance of the combination of all elements above the concrete. Δ IIC 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.

DITRA-HEAT-DUO

Schluter®-DITRA-HEAT integrates electric floor warming with the functions associated with DITRA: uncoupling, waterproofing, vapor management and load support. Schluter®-DITRA-HEAT-DUO 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 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 Δ IIC 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	Δ IIC = 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
4	IN17_059	ASTM E492	6" Concrete	RSIC-1 clips with gypsum board	IIC = 60

No.	Report	Floor-Ceiling Sketch
Schluter®-DITRA-HEAT-DUO		
1	<ul style="list-style-type: none"> 8" concrete slab No ceiling 	<p>Tile and underlayment 8.625" Concrete slab Floor-ceiling thickness = 8.625"</p>
2	<ul style="list-style-type: none"> 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 	<p>Tile and underlayment 8.625" Concrete slab 9" Steel Wire Furring Channel Gypsum Board Floor-ceiling thickness = 17.625"</p>
3	<ul style="list-style-type: none"> 6" concrete slab RSIC-1 clips with 7/8" furring channel R-11 unfaced fiberglass batt insulation 5/8" gypsum board 	<p>Tile and underlayment 6.625" Concrete slab 1.625" RSIC-1 Clips Gypsum Board Floor-ceiling thickness = 8.25"</p>

*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

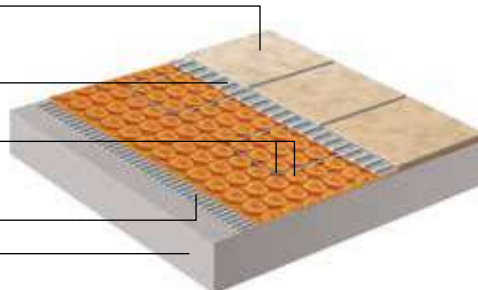
Ceramic, porcelain or stone tile

Schluter **SET**®, Schluter **ALL-SET**®, Schluter **FAST-SET**®, or unmodified thin-set mortar

DITRA-HEAT or DITRA-HEAT-DUO uncoupling membrane and heating cables

Schluter **SET**®, Schluter **ALL-SET**®, Schluter **FAST-SET**®, or unmodified thin-set mortar

Concrete



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.¹ However, both of these solutions increase material and labor costs.

A one-step solution

Schluter®-DITRA-HEAT-DUO offers the same functions as the Schluter®-DITRA-HEAT 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 membrane is only 5/16" (8 mm)-thick, compared to DITRA-HEAT 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 morning 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

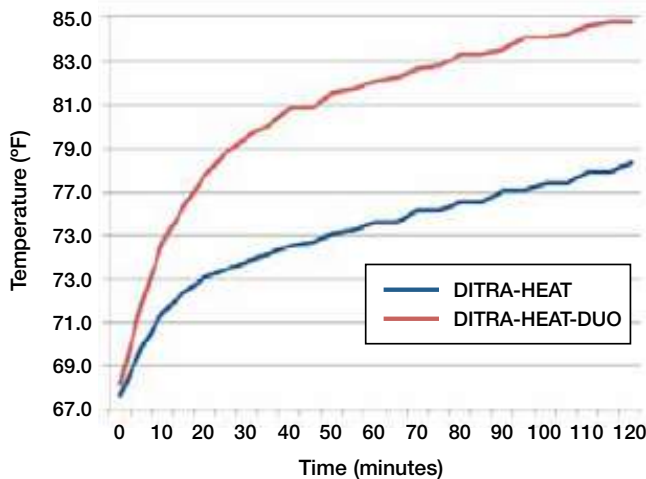
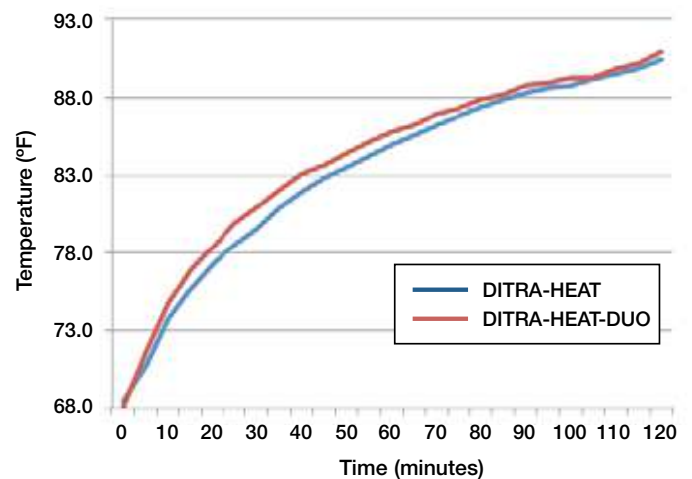


Figure 2 - DITRA-HEAT-DUO Performance over Wood



Schluter®-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 Schluter®-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 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 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 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 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

Schluter®-DITRA-HEAT offers complete flexibility when creating warm floors in any application. Schluter®-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/ft² 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/ft², 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

Schluter®-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. Since radiant heat contributes to approximately 55% of the total heat, the 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.
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 $^{\circ}C$

ΔT^* Total heat Output			ΔT^* Total heat Output		
$^{\circ}F$	(W/ft^2)	($Btu/hr/ft^2$)	$^{\circ}C$	(W/m^2)	($Btu/hr/m^2$)
2	0.9	3.2	1	8.9	30.4
4	2.0	6.8	2	19.1	65.2
6	3.1	10.6	3	29.9	101
8	4.3	14.6	4	41.0	140
10	5.5	18.6	5	52.4	179
12	6.7	22.8	6	64.0	218
14	7.9	27.0	7	75.9	259
16	9.2	31.3	8	87.9	300
18	10.4	35.6	9	100	341
20	11.7	40.0	10	112	383

* ΔT = Temperature Differential between Floor Surface and Operative Temperature

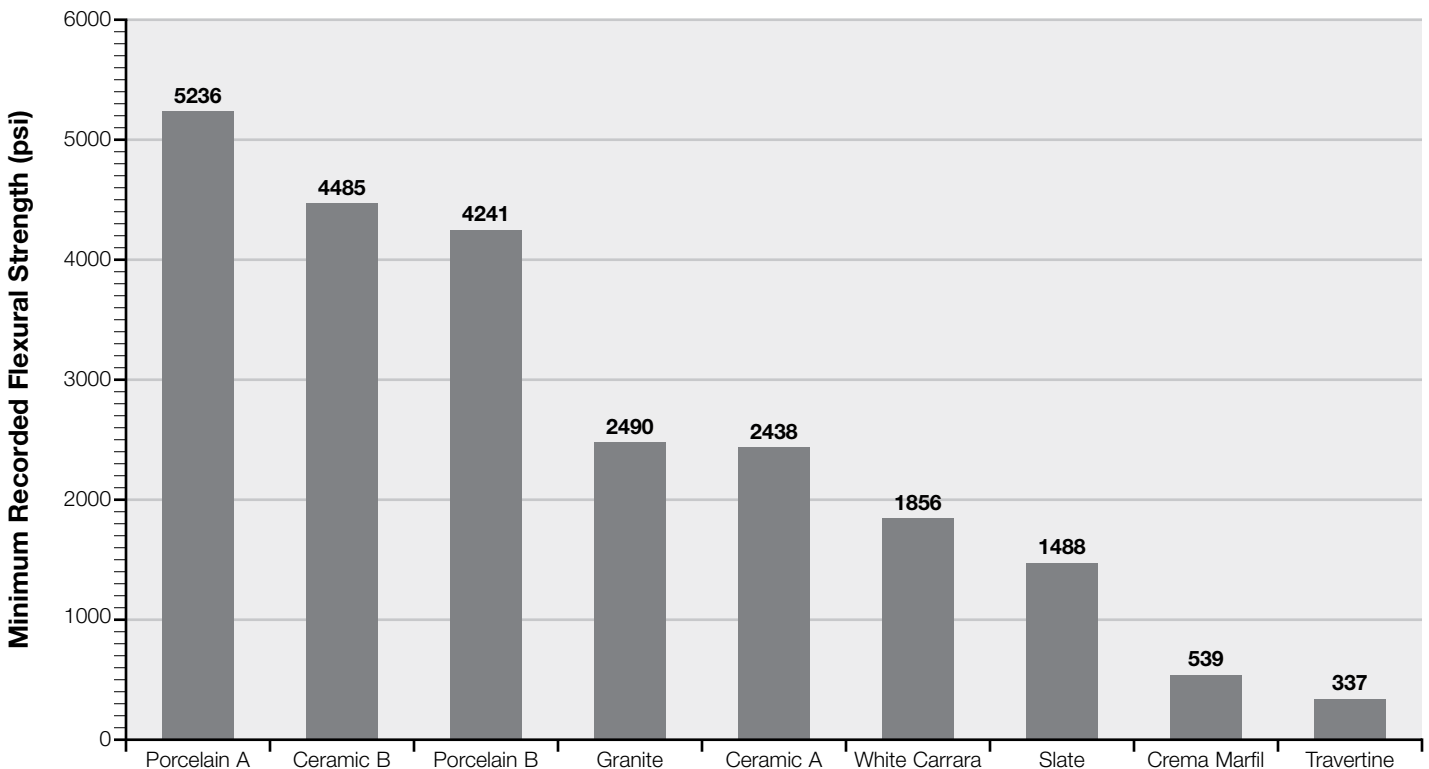
For example, in a typical situation where the floor surface temperature is 82°F and the operative temperature is 72°F, the differential is 10°F, so the total heat output from the floor surface is 5.5 W/ft^2 or 18.6 $Btu/hr/ft^2$.

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 recommend 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 16 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.

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 21 in this DITRA-HEAT Installation Handbook 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) day 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: Thermostat 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: Thermostat 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: Thermostat 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: _____

Certified electrician: _____ Date put into service*: _____

Identification	Factory Value	Before Installation	After Cable Installation	After Tile Installation
Test 1: Conductor Resistance Test				
Readings must fall within 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: Thermostat Floor Temperature Sensor Test				
	Temperature		Resistance	
	°C	°F	Kohms	
	10	50	18.1	
	15	59	14.8	
	20	68	12.1	
	25	77	10.0	
	30	86	8.3	

* Allow the assembly to cure for 7 days after grouting before putting the floor warming into service.

**1 Gigaohms = 1 G ohms = 1000 M ohms = 1000 Mega ohms

WARRANTIES

Schluter®-DITRA-HEAT System 15-Year Limited Warranty

LIMITED WARRANTY COVERAGE: Subject to the conditions and limitations as stated in this Schluter®-DITRA-HEAT System 15-Year Limited Warranty (the “Limited Warranty”), Schluter Systems warrants that its Schluter®-DITRA-HEAT System (defined hereafter) will be free from manufacturing defects and will perform as described in the Schluter®-DITRA-HEAT Installation Handbook and Schluter®-DITRA-HEAT Technical Data Sheet (collectively, the “Written Materials”) for a period of fifteen (15) years from the date of purchase when installed and used in accordance with the terms and conditions of the Written Materials and industry standard guidelines that are not in conflict with the Written Materials in effect at the time of installation.

In order to receive coverage under this Limited Warranty, the Owner (defined hereafter) 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: Thermostat Floor Temperature Sensor 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 results for “Test 1: Conductor Resistance,” “Test 2: Conductor and Ground Braid Continuity,” and “Test 4: Thermostat Floor Temperature Sensor 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: Thermostat Floor Temperature Sensor Test,” such installation does not qualify for coverage under this Limited Warranty; such installation may instead receive warranty coverage under the Schluter®-DITRA-HEAT and Schluter®-DITRA-HEAT-DUO Uncoupling Membrane 10-Year Limited Warranty.

For the purposes of this Limited Warranty, a “DITRA-HEAT System” is defined as Schluter®-DITRA-HEAT or Schluter-DITRA-HEAT-DUO uncoupling membrane and Schluter®-DITRA-HEAT-E-HK heating cables; “Owner” is defined as the original end user of the property in which the DITRA-HEAT System is installed; and “Floor Covering Assembly” is defined to include the DITRA-HEAT System, non-reusable flooring surfaces, and applicable setting and grouting materials.

This Limited Warranty is only applicable to installations in the United States of America and Canada. Schluter Systems is not responsible or liable under any circumstances for determining the suitability of a DITRA-HEAT System for the Owner’s intended purpose. It is the responsibility of the Owner to consult with an experienced and professional installer to ensure the suitability of a DITRA-HEAT System, subfloor/substrate and all building materials in the installation and that the Written Materials are followed properly.

RESOLUTION: If a DITRA-HEAT System is installed and used in accordance with the terms and conditions as described hereinabove and such DITRA-HEAT System is proven defective within the applicable warranty term, the Owner’s exclusive remedy and the sole obligation of Schluter Systems, at its election, shall be to (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. Due to conditions beyond the control of Schluter Systems (e.g., color and shade availability, discontinuation, normal wear and tear), Schluter Systems cannot guarantee or warrant an exact match to the specific tile, stone, or other flooring materials used in the original installation. In such event, substantially similar materials may be substituted. This Limited Warranty does not cover the cost of disconnection or installation.

EXCLUSIONS FROM COVERAGE: This Limited Warranty excludes and in no event shall Schluter Systems have any liability for any indirect, special, incidental, punitive, exemplary, or consequential damages, including lost profits, arising out of or otherwise connected to the failure of DITRA-HEAT System, regardless of any strict liability or active or passive negligence of Schluter Systems, and regardless of legal theory, whether in contract, tort, extra-contractual or other. This Limited Warranty further excludes any loss or damage arising out of or otherwise connected to: acts of war, terrorism, fire, explosion, natural disaster, acts of God, any failure to comply with the Written Materials, inadequate subfloor/substrate, improper preparation or other failure of subfloor/substrate, faulty or negligent penetration of a DITRA-HEAT System or subfloor/substrate, intentional acts of destruction, structural failure, misuse of or failure to maintain a DITRA-HEAT System, normal wear and tear, scratches, dents, corrosion or discoloration (whether caused by excessive heat, chemical cleaning products, abrasive agents or otherwise), efflorescence and shading which are a natural occurrence with cementitious materials and are not considered a defective condition for the purposes of this Limited Warranty, variations of texture, color or shade from those on product samples, packaging materials or other marketing materials, or other causes unrelated to a DITRA-HEAT System (e.g. floor covering failure, excess point loading, overvoltage). This Limited Warranty excludes exterior applications and applications utilizing glass tile or other non-approved floor coverings, unless specifically approved in writing on a case by case basis by the Schluter Systems Technical Services Director. Schluter® DITRA-HEAT™-E thermostats are specifically excluded from coverage under this Limited Warranty; warranty coverage for Schluter® DITRA-HEAT™-E thermostats are limited and subject to the Schluter-DITRA-HEAT Thermostat 3-Year Limited Warranty. Any substitution of a non-Schluter Systems product for a Schluter Systems component in a DITRA-HEAT System voids this Limited Warranty.

This Limited Warranty is conditioned and will be considered null and void and Schluter Systems will have the right to refuse any claims if: (a) a DITRA-HEAT System has been improperly stored or installed, (b) any component comprising a DITRA-HEAT System has been altered or otherwise modified in any way, (c) a DITRA-HEAT System is subject to abusive or abnormal use, lack of maintenance, or used in a manner other than that for which the DITRA-HEAT System was designed or in any way contrary to the Written Materials, (d) the nameplate numbers (electrical rating label) are not accessible, readable or recognizable or have been removed from the applicable heating cables or other components, if applicable, or (e) the Owner fails to return a copy of the completed heating cable tests log with the warranty registration card.

DISCLAIMER: There are no warranties beyond this expressed warranty as stated herein. To the extent permitted by law, all other warranties, representations or conditions, expressed or implied, are hereby disclaimed and excluded, including but not limited to the implied warranties of **MERCHANTABILITY** or **FITNESS FOR A PARTICULAR PURPOSE** (as limited to such purposes as described in the Written Materials) or arising from a course of dealing, usage of trade or otherwise by law. ANY IMPLIED WARRANTIES ARISING BY OPERATION OF LAW ARE LIMITED IN DURATION TO THE TERM OF THIS LIMITED WARRANTY. NO REPRESENTATION, PROMISE, AFFIRMATION OR STATEMENT BY ANY EMPLOYEE OR AGENT OF SCHLUTER SYSTEMS WILL BE ENFORCEABLE AGAINST SCHLUTER SYSTEMS UNLESS IT IS SPECIFICALLY INCLUDED IN THIS LIMITED WARRANTY OR AUTHORIZED IN WRITING BY THE SCHLUTER SYSTEMS TECHNICAL SERVICES DIRECTOR. This Limited Warranty is given in lieu of any other warranty, whether expressed or implied. The remedies contained herein are the only remedies available for breach of this Limited Warranty. Schluter Systems excludes and in no event shall have any liability for any indirect, special, incidental, punitive, exemplary, or consequential damages, including lost profits, arising out of or otherwise connected to failure of a DITRA-HEAT System. This Limited Warranty extends only to the Owner and is not transferable or assignable unless authorized by written agreement and signed by the Schluter Systems Technical Services Director or otherwise prohibited by specific state or provincial law. This Limited Warranty gives you specific legal rights; some states and provinces do not allow disclaimers or other restrictions of implied warranties; some of the above disclaimers may not apply to you. **No changes or modifications of any terms or conditions of this Limited Warranty are permitted unless duly authorized in writing by the Schluter Systems Technical Services Director.** This Limited Warranty shall supersede and replace any and all prior oral or written warranties, agreements, or other representations made by or on behalf of Schluter Systems relative to a DITRA-HEAT System or the application of a DITRA-HEAT System and shall apply to any installation occurring on or after March 13, 2019. If the Schluter®-DITRA-HEAT or Schluter®-DITRA-HEAT-DUO uncoupling membrane are used in conjunction with other Schluter products, a different Schluter warranty may apply. For the most current information and materials regarding Schluter Systems warranties and programs, please visit https://www.schluter.com/schluter-us/en_US/downloadfiles.

MAKING A CLAIM: To make a claim under this Limited Warranty, the Owner must provide Schluter Systems with written notice within thirty (30) days of any alleged defect in a DITRA-HEAT System covered by this Limited Warranty, together with date and proof of purchase of such DITRA-HEAT System and/or all of its components and name and address of all installers and all invoices related to the original installation, failing which this Limited Warranty shall have no legal effect. Schluter Systems reserves the right at its election and as a condition of this Limited Warranty to inspect the alleged failed and/or defective DITRA-HEAT System.

All U.S. Claims shall be sent to:
Schluter Systems L.P.
Attn: Warranty Claims Dept.
194 Pleasant Ridge Road
Plattsburgh, NY 12901-5841

All Canadian Claims shall be sent to:
Schluter Systems (Canada), Inc.
Attn: Warranty Claims Dept.
21100 chemin Ste-Marie
Ste-Anne-de-Bellevue, QC H9X 3Y8

¹ If there are any conflicting terms between any Written Materials, the most recently updated document shall be deemed to control.

² This Limited Warranty is limited to sales of DITRA-HEAT Systems made in and intended for use in the United States and Canada. For the purposes of this Limited Warranty, Schluter Systems L.P. shall offer warranty coverage to Owners located in the United States, and Schluter Systems (Canada) Inc. shall offer warranty coverage to Owners located in Canada.

³ In the event that Owner fails to provide such required invoices relating to the original installation, Schluter Systems shall pay Owner an amount equal to the average, reasonable costs of a comparable installation. If the parties fail to agree on such amount, such dispute shall promptly, and in the first instance, be submitted: (a) if a U.S. claim, to arbitration in Clinton County, New York, in accordance with the rules of the American Arbitration Association, or (b) if a Canadian claim, in the Province of Quebec, Canada, in accordance with the ADRIAC Arbitration Rules. Any outcome of such arbitration proceeding shall be final and binding upon the parties hereto.

Schluter®-DITRA-HEAT and Schluter®-DITRA-HEAT-DUO 10-Year Limited Warranty

LIMITED WARRANTY COVERAGE: Subject to the conditions and limitations as stated in this **Schluter®-DITRA-HEAT and Schluter-DITRA-HEAT-DUO Uncoupling Membrane 10-Year Limited Warranty** (the “**Limited Warranty**”), Schluter Systems warrants that its Schluter®-DITRA-HEAT and Schluter-DITRA-HEAT-DUO uncoupling membranes (the “**Products**”) will be free from manufacturing defects and will perform as described in the Schluter®-DITRA-HEAT Installation Handbook and Schluter®-DITRA-HEAT Technical Data Sheet (collectively, the “**Written Materials**”) for a period of ten (10) years from the date of purchase when installed and used in accordance with the terms and conditions of the Written Materials and industry standard guidelines that are not in conflict with the Written Materials in effect at the time of installation.

For the purposes of this Limited Warranty, “**Owner**” is defined as the original end user of the property in which the Products are installed; and “**Floor Covering Assembly**” is defined to include the Products, non-reusable flooring surfaces, and applicable setting and grouting materials.

This Limited Warranty is only applicable to installations in the United States of America and Canada. Schluter Systems is not responsible or liable under any circumstances for determining the suitability of the Products for the Owner's intended purpose. It is the responsibility of the Owner to consult with an experienced and professional installer to ensure the suitability of the Products, subfloor/substrate and all building materials in the installation and that the Written Materials are followed properly.

RESOLUTION: If the Products are installed and used in accordance with the terms and conditions as described hereinabove and such Products are proven defective within the applicable warranty term, the Owner's exclusive remedy and the sole obligation of Schluter Systems, at its election, shall be to (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. Due to conditions beyond the control of Schluter Systems (e.g., color and shade availability, discontinuation, normal wear and tear), Schluter Systems cannot guarantee or warrant an exact match to the specific tile, stone, or other flooring materials used in the original installation. In such event, substantially similar materials may be substituted. This Limited Warranty does not cover the cost of disconnection or installation.

EXCLUSIONS FROM COVERAGE: This Limited Warranty excludes and in no event shall Schluter Systems have any liability for any indirect, special, incidental, punitive, exemplary, or consequential damages, including lost profits, arising out of or otherwise connected to the failure of the Products, regardless of any strict liability or active or passive negligence of Schluter Systems, and regardless of legal theory, whether in contract, tort, extra-contractual or other. This Limited Warranty further excludes any loss or damage arising out of or otherwise connected to: acts of war, terrorism, fire, explosion, natural disaster, acts of God, any failure to comply with the Written Materials, inadequate subfloor/substrate, improper preparation or other failure of subfloor/substrate, faulty or negligent penetration of the Products or subfloor/substrate, intentional acts of destruction, structural failure, misuse of or failure to maintain the Products, normal wear and tear, scratches, dents, corrosion or discoloration (whether caused by excessive heat, chemical cleaning products, abrasive agents or otherwise), efflorescence and shading which are a natural occurrence with cementitious materials and are not considered a defective condition for the purposes of this Limited Warranty, variations of texture, color or shade from those on product samples, packaging materials or other marketing materials, or other causes unrelated to the Products (e.g. floor covering failure, excess point loading, overvoltage). This Limited Warranty excludes exterior applications and applications utilizing glass tile or other non-approved floor coverings, unless specifically approved in writing on a case by case basis by the Schluter Systems Technical Services Director.

This Limited Warranty is conditioned and will be considered null and void and Schluter Systems will have the right to refuse any claims if: (a) the Products have been improperly stored or installed, (b) the Products are subject to abusive or abnormal use, lack of maintenance, or used in a manner other than that for which the Products were designed or in any way contrary to the Written Materials, or (c) any non-Schluter heating cable is installed with Schluter®-DITRA-HEAT or Schluter®-DITRA-HEAT-DUO uncoupling membrane.

DISCLAIMER: There are no warranties beyond this expressed warranty as stated herein. To the extent permitted by law, all other warranties, representations or conditions, expressed or implied, are hereby disclaimed and excluded, including but not limited to the implied warranties of **MERCHANTABILITY** or **FITNESS FOR A PARTICULAR PURPOSE** (as limited to such purposes as described in the Written Materials) or arising from a course of dealing, usage of trade or otherwise by law. ANY IMPLIED WARRANTIES ARISING BY OPERATION OF LAW ARE LIMITED IN DURATION TO THE TERM OF THIS LIMITED WARRANTY. NO REPRESENTATION, PROMISE, AFFIRMATION OR STATEMENT BY ANY EMPLOYEE OR AGENT OF SCHLUTER SYSTEMS WILL BE ENFORCEABLE AGAINST SCHLUTER SYSTEMS UNLESS IT IS SPECIFICALLY INCLUDED IN THIS LIMITED WARRANTY OR AUTHORIZED IN WRITING BY THE SCHLUTER SYSTEMS TECHNICAL SERVICES DIRECTOR. This Limited Warranty is given in lieu of any other warranty, whether expressed or implied. The remedies contained herein are the only remedies available for breach of this Limited Warranty. Schluter Systems excludes and in no event shall have any liability for any indirect, special, incidental, punitive, exemplary, or consequential damages, including lost profits, arising out of or otherwise connected to failure of a DITRA-HEAT System. This Limited Warranty extends only to the Owner and is not transferable or assignable unless authorized by written agreement and signed by the Schluter Systems Technical Services Director or otherwise prohibited by specific state or provincial law. This Limited Warranty gives you specific legal rights; some states and provinces do not allow disclaimers or other restrictions of implied warranties; some of the above disclaimers may not apply to you. **No changes or modifications of any terms or conditions of this Limited Warranty are permitted unless duly authorized in writing by the Schluter Systems Technical Services Director.** This Limited Warranty shall supersede and replace any and all prior oral or written warranties, agreements, or other representations made by or on behalf of Schluter Systems relative to the Products or the application of the Products and shall apply to any installation occurring on or after March 13, 2019. If the Schluter®-DITRA-HEAT or Schluter®-DITRA-HEAT-DUO uncoupling membrane are used in conjunction with other Schluter products, a different Schluter warranty may apply. For the most current information and materials regarding Schluter Systems warranties and programs, please visit https://www.schluter.com/schluter-us/en_US/downloadfiles.

MAKING A CLAIM: To make a claim under this Limited Warranty, the Owner must provide Schluter Systems² with written notice within thirty (30) days of any alleged defect in the Products covered by this Limited Warranty, together with date and proof of purchase of such Products and/or all of its components and name and address of all installers and all invoices related to the original installation, failing which this Limited Warranty shall have no legal effect³. Schluter Systems reserves the right at its election and as a condition of this Limited Warranty to inspect the alleged failed and/or defective Products.

All U.S. Claims shall be sent to:

Schluter Systems L.P.
Attn: Warranty Claims Dept.
194 Pleasant Ridge Road
Plattsburgh, NY 12901

All Canadian Claims shall be sent to:

Schluter Systems (Canada), Inc.
Attn: Warranty Claims Dept.
21100 chemin Ste-Marie
Ste-Anne-de-Bellevue, QC H9X 3Y8

¹ If there are any conflicting terms between any Written Materials, the most recently updated document shall be deemed to control.

² This Limited Warranty is limited to sales of the Products made in and intended for use in the United States and Canada. For the purposes of this Limited Warranty, Schluter Systems L.P. shall offer warranty coverage to Owners located in the United States, and Schluter Systems (Canada) Inc. shall offer warranty coverage to Owners located in Canada.

³ In the event that Owner fails to provide such required invoices relating to the original installation, Schluter Systems shall pay Owner an amount equal to the average, reasonable costs of a comparable installation. If the parties fail to agree on such amount, such dispute shall promptly, and in the first instance, be submitted: (a) if a U.S. claim, to arbitration in Clinton County, New York, in accordance with the rules of the American Arbitration Association, or (b) if a Canadian claim, in the Province of Quebec, Canada, in accordance with the ADRI Arbitration Rules. Any outcome of such arbitration proceeding shall be final and binding upon the parties hereto.

Schluter®-DITRA-HEAT Thermostat 3-Year Limited Warranty

LIMITED WARRANTY COVERAGE: Subject to the conditions and limitations as stated in this **Schluter®-DITRA-HEAT Thermostat 3-Year Limited Warranty** (the “**Limited Warranty**”), Schluter Systems warrants that its Programmable Wi-Fi Thermostat (DHE RT 104/BW), Touchscreen Programmable Thermostat (DHE RT 102/BW), Non-Programmable Thermostat (DHE RT 103/BW), and Power Module (DHE RR 1/BW) (hereafter collectively referred to as the “**Products**”) will be free from manufacturing defects and will perform as described in the applicable Schluter®-DITRA-HEAT Thermostat User Guide and/or Quick Start Guide (collectively, the “**Written Materials**”) for a period of three (3) years from the date of purchase when installed and used in accordance with the terms and conditions of the Written Materials and industry standard guidelines that are not in conflict with the Written Materials in effect at the time of installation.

For the purposes of this Limited Warranty, “**Owner**” is defined as the original end user of the property in which the Products are installed.

This Limited Warranty is only applicable to installations in the United States of America and Canada. Schluter Systems is not responsible or liable under any circumstances for determining the suitability of the Products for the Owner’s intended purpose. It is the responsibility of the Owner to consult with an experienced and professional installer to ensure the suitability of the Products, subfloor/substrate and all building materials in the installation and that the Written Materials are followed properly.

RESOLUTION: If the Products are installed and used in accordance with the terms and conditions as described hereinabove and such Products are proven defective within the applicable warranty term, the Owner’s exclusive remedy and the sole obligation of Schluter Systems, at its election, shall be to repair or replace the Products, and does not cover the cost of disconnection, transport, and installation.

EXCLUSIONS FROM COVERAGE: This Limited Warranty excludes and in no event shall Schluter Systems have any liability for any indirect, special, incidental, punitive, exemplary, or consequential damages, including lost profits, arising out of or otherwise connected to the failure of the Products, regardless of any strict liability or active or passive negligence of Schluter Systems, and regardless of legal theory, whether in contract, tort, extra-contractual or other. This Limited Warranty further excludes any loss or damage arising out of or otherwise connected to: acts of war, terrorism, fire, explosion, natural disaster, acts of God, any failure to comply with the Written Materials, inadequate subfloor/substrate, improper preparation or other failure of subfloor/substrate, faulty or negligent penetration of the Products or subfloor/substrate, intentional acts of destruction, structural failure, misuse of or failure to maintain the Products, normal wear and tear, scratches, dents, corrosion or discoloration (whether caused by excessive heat, chemical cleaning products, abrasive agents or otherwise), efflorescence and shading which are a natural occurrence with cementitious materials and are not considered a defective condition for the purposes of this Limited Warranty, variations of texture, color or shade from those on product samples, packaging materials or other marketing materials, or other causes unrelated to the Products (e.g. excess point loading, overvoltage). This Limited Warranty excludes exterior applications, unless specifically approved in writing on a case by case basis by the Schluter Systems Technical Services Director.

This Limited Warranty is conditioned and will be considered null and void and Schluter Systems will have the right to refuse any claims if: (a) the Products have been improperly stored or installed, (b) any component comprising a Schluter® DITRA-HEAT System has been altered or otherwise modified in any way, or (c) the Products are subject to abusive or abnormal use, lack of maintenance, or used in a manner other than that for which the Products were designed or in any way contrary to the Written Materials

DISCLAIMER: There are no warranties beyond this expressed warranty as stated herein. To the extent permitted by law, all other warranties, representations or conditions, expressed or implied, are hereby disclaimed and excluded, including but not limited to the implied warranties of **MERCHANTABILITY** or **FITNESS FOR A PARTICULAR PURPOSE** (as limited to such purposes as described in the Written Materials) or arising from a course of dealing, usage of trade or otherwise by law. ANY IMPLIED WARRANTIES ARISING BY OPERATION OF LAW ARE LIMITED IN DURATION TO THE TERM OF THIS LIMITED WARRANTY. NO REPRESENTATION, PROMISE, AFFIRMATION OR STATEMENT BY ANY EMPLOYEE OR AGENT OF SCHLUTER SYSTEMS WILL BE ENFORCEABLE AGAINST SCHLUTER SYSTEMS UNLESS IT IS SPECIFICALLY INCLUDED IN THIS LIMITED WARRANTY OR AUTHORIZED IN WRITING BY THE SCHLUTER SYSTEMS TECHNICAL SERVICES DIRECTOR. This Limited Warranty is given in lieu of any other warranty, whether expressed or implied. The remedies contained herein are the only remedies available for breach of this Limited Warranty. Schluter Systems excludes and in no event shall have any liability for any indirect, special, incidental, punitive, exemplary, or consequential damages, including lost profits, arising out of or otherwise connected to failure of a DITRA-HEAT System. This Limited Warranty extends only to the Owner and is not transferable or assignable unless authorized by written agreement and signed by the Schluter Systems Technical Services Director or otherwise prohibited by specific state or provincial law. This Limited Warranty gives you specific legal rights; some states and provinces do not allow disclaimers or other restrictions of implied warranties; some of the above disclaimers may not apply to you. **No changes or modifications of any terms or conditions of this Limited Warranty are permitted unless duly authorized in writing by the Schluter Systems Technical Services Director.** This Limited Warranty shall supersede and replace any and all prior oral or written warranties, agreements, or other representations made by or on behalf of Schluter Systems relative to the Products or the application of the Products and shall apply to any installation occurring on or after August 1, 2017. For the most current information and materials regarding Schluter Systems warranties and programs, please visit https://www.schluter.com/schluter-us/en_US/downloadfiles.

MAKING A CLAIM: To make a claim under this Limited Warranty, the Owner must provide Schluter Systems with written notice within thirty (30) days of any alleged defect in the Products covered by this Limited Warranty, together with date and proof of purchase of such Products and/or all of its components and name and address of all installers and all invoices related to the original installation, failing which this Limited Warranty shall have no legal effect. Schluter Systems reserves the right at its election and as a condition of this Limited Warranty to inspect the alleged failed and/or defective Products.

All U.S. Claims shall be sent to:

Schluter Systems L.P.
Attn: Warranty Claims Dept.
194 Pleasant Ridge Road
Plattsburgh, NY 12901

All Canadian Claims shall be sent to:

Schluter Systems (Canada), Inc.
Attn: Warranty Claims Dept.
21100 chemin Ste-Marie
Ste-Anne-de-Bellevue, QC H9X 3Y8

¹ If there are any conflicting terms between any Written Materials, the most recently updated document shall be deemed to control.

² This Limited Warranty is limited to sales of the Products made in and intended for use in the United States and Canada. For the purposes of this Limited Warranty, Schluter Systems L.P. shall offer warranty coverage to Owners located in the United States, and Schluter Systems (Canada) Inc. shall offer warranty coverage to Owners located in Canada.

Schluter®-Systems Lifetime Thin-Set System Extended Limited Warranty

LIMITED WARRANTY COVERAGE: Subject to the conditions and limitations as stated in this **Lifetime Thin-Set System Extended Limited Warranty** (the "**Limited Warranty**"), Schluter Systems warrants that a Thin-Set System (defined hereafter) will be free from manufacturing defects and will perform as described in the applicable installation handbook(s) and/or technical data sheet(s) (collectively, the "**Written Materials**") for the lifetime (defined hereafter) of such Thin-Set System when installed in a Residential or Commercial application (defined hereafter) and used in accordance with the terms and conditions of the Written Materials and industry standard guidelines that are not in conflict with the Written Materials in effect at the time of installation. In order to extend warranty coverage for Schluter® DITRA® or DITRA®-XL uncoupling membranes, Schluter®-Shower System, Schluter® KERDI® or KERDI®-DS waterproofing membranes, or Schluter® DITRA-HEAT™ or Schluter® DITRA-HEAT-DUO™ uncoupling membrane to lifetime coverage under this Lifetime Thin-Set System Extended Limited Warranty, Owner must complete and submit the Thin-Set System Registration to Schluter Systems, available at www.schluter.com, or submit proof of purchase and installation information (including installation date, installer's name and address) to Schluter Systems at the address provided hereafter within ninety (90) days of installation. Note: Please retain Schluter® Thin-set Mortar Lot/Batch Number(s) for Lifetime Warranty Registration. These numbers are required for completion of the warranty registration process.

For the purposes of this Limited Warranty, a "**Thin-Set System**" is defined as Schluter® DITRA® or DITRA®-XL uncoupling membranes, Schluter®-Shower System, Schluter®-KERDI®-BOARD within a Schluter®-Shower System, Schluter® KERDI® or KERDI®-DS waterproofing membranes, or Schluter® DITRA-HEAT™ or Schluter® DITRA-HEAT-DUO™ uncoupling membrane installed with Schluter SET®, Schluter ALL-SET®, or Schluter FAST-SET® thin-set mortar; "**Owner**" is defined as the original end user of the property in which a Thin-Set System is installed; "**Lifetime**" is defined as that period of time that the original Thin-Set System installation remains unchanged and under the ownership of the Owner; "**Residential**" applications are defined to include Thin-Set System installations in single family detached residential dwellings; and "**Commercial**" applications are defined to include Thin-Set System installations in multi-family residential dwellings (e.g., apartments, condominiums, cooperatives, and timeshares). Thin-Set System installations in public places, commercial establishments and other applications may be afforded lifetime coverage under this Limited Warranty on a case by case basis as determined by the Schluter Systems Technical Services Director.

This Limited Warranty is only applicable to installations in the United States of America and Canada. Schluter Systems is not responsible or liable under any circumstances for determining the suitability of a Thin-Set System for the Owner's intended purpose. It is the responsibility of the Owner to consult with an experienced and professional installer to ensure the suitability of a Thin-Set System, subfloor/substrate and all building materials in the installation and that the Written Materials are followed properly.

RESOLUTION: If a Thin-Set System is installed and used in accordance with the terms and conditions as described hereinabove and such Thin-Set System is proven defective within the applicable warranty term, the Owner's exclusive remedy and the sole obligation of Schluter Systems, at its election, shall be to (a) reinstall or replace the failed portion of the Thin-Set System or (b) pay an amount not to exceed the original square foot cost of the installation of the Thin-Set System verified to be defective. Due to conditions beyond the control of Schluter Systems (e.g., color and shade availability, discontinuation, normal wear and tear), Schluter Systems cannot guarantee or warrant an exact match to the specific tile, stone, or other flooring materials used in the original installation. In such event, substantially similar materials may be substituted.

EXCLUSIONS FROM COVERAGE: This Limited Warranty excludes and in no event shall Schluter Systems have any liability for any indirect, special, incidental, punitive, exemplary, or consequential damages, including lost profits, arising out of or otherwise connected to the failure of a Thin-Set System, regardless of any strict liability or active or passive negligence of Schluter Systems, and regardless of legal theory, whether in contract, tort, extra-contractual or other. This Limited Warranty further excludes any loss or damage arising out of or otherwise connected to: acts of war, terrorism, fire, explosion, natural disaster, acts of God, any failure to comply with the Written Materials, inadequate subfloor/substrate, improper preparation or other failure of subfloor/substrate, faulty or negligent penetration of a Thin-Set System or subfloor/substrate, intentional acts of destruction, structural failure, misuse of or failure to maintain a Thin-Set System, normal wear and tear, scratches, dents, corrosion or discoloration (whether caused by excessive heat, chemical cleaning products, abrasive agents or otherwise), efflorescence and shading which are a natural occurrence with cementitious materials and are not considered a defective condition for the purposes of this Limited Warranty, variations of texture, color or shade from those on product samples, packaging materials or other marketing materials, or other causes unrelated to a Thin-Set System (e.g. surface covering failure, excess point loading, overvoltage). This Limited Warranty excludes exterior, submerged and steam room applications and further excludes applications using glass tile, moisture sensitive stone, or other non-approved surface coverings, unless specifically approved in writing on a case by case basis by the Schluter Systems Technical Services Director. Schluter® DITRA-HEAT™-E-HK heating cables and Schluter® DITRA-HEAT™-E thermostats are specifically excluded from coverage under this Limited Warranty. Any substitution of a non-Schluter Systems product for a Schluter Systems component in a Thin-Set System voids this Limited Warranty.

DISCLAIMER: There are no warranties beyond this expressed warranty as stated herein. To the extent permitted by law, all other warranties, representations or conditions, expressed or implied, are hereby disclaimed and excluded, including but not limited to the implied warranties of **MERCHANTABILITY** or **FITNESS FOR A PARTICULAR PURPOSE** (as limited to such purposes as described in the Written Materials) or arising from a course of dealing, usage of trade or otherwise by law. ANY IMPLIED WARRANTIES ARISING BY OPERATION OF LAW ARE LIMITED IN DURATION TO THE TERM OF THIS LIMITED WARRANTY. NO REPRESENTATION, PROMISE, AFFIRMATION OR STATEMENT BY ANY EMPLOYEE OR AGENT OF SCHLUTER SYSTEMS WILL BE ENFORCEABLE AGAINST SCHLUTER SYSTEMS UNLESS IT IS SPECIFICALLY INCLUDED IN THIS LIMITED WARRANTY OR AUTHORIZED IN WRITING BY THE SCHLUTER SYSTEMS TECHNICAL SERVICES DIRECTOR. This Limited Warranty is given in lieu of any other warranty, whether expressed or implied. The remedies contained herein are the only remedies available for breach of this Limited Warranty. Schluter Systems excludes and in no event shall have any liability for any indirect, special, incidental, punitive, exemplary, or consequential damages, including lost profits, arising out of or otherwise connected to failure of a Thin-Set System. This Limited Warranty extends only to the Owner and is not transferable or assignable unless authorized by written agreement and signed by the Schluter Systems Technical Services Director or otherwise prohibited by specific state or provincial law. This Limited Warranty gives you specific legal rights; some states and provinces do not allow disclaimers or other restrictions of implied warranties; some of the above disclaimers may not apply to you. **No changes or modifications of any terms or conditions of this Limited Warranty are permitted unless duly authorized in writing by the Schluter Systems Technical Services Director.** This Limited Warranty shall supersede and replace any and all prior oral or written warranties, agreements, or other representations made by or on behalf of Schluter Systems relative to a Thin-Set System or the application of a Thin-Set System and shall apply to any installation occurring on or after March 13, 2019. For the most current information and materials regarding Schluter Systems warranties and programs, please visit https://www.schluter.com/schluter-us/en_US/downloadfiles.

MAKING A CLAIM: To make a claim under this Limited Warranty, the Owner must provide Schluter Systems with written notice within thirty (30) days of any alleged defect in a Thin-Set System covered by this Limited Warranty, together with date and proof of purchase of such Thin-Set System and/or all of its components and name and address of all installers and all invoices related to the original installation, failing which this Limited Warranty shall have no legal effect. Schluter Systems reserves the right at its election and as a condition of this Limited Warranty to inspect the alleged failed and/or defective Thin-Set System.

All U.S. Claims shall be sent to:
Schluter Systems L.P.
Attn: Warranty Claims Dept.
194 Pleasant Ridge Road
Plattsburgh, NY 12901-5841

All Canadian Claims shall be sent to:
Schluter Systems (Canada), Inc.
Attn: Warranty Claims Dept.
21100 chemin Ste-Marie
Ste-Anne-de-Bellevue, QC H9X 3Y8

¹If there are any conflicting terms between any Written Materials, the most recently updated document shall be deemed to control.

²In the event that Owner fails to provide such required invoices relating to the original installation, Schluter Systems shall pay Owner an amount equal to the average, reasonable costs of a comparable installation. If the parties fail to agree on such amount, such dispute shall promptly, and in the first instance, be submitted: (a) if a U.S. claim, to arbitration in Clinton County, New York, in accordance with the rules of the American Arbitration Association, or (b) if a Canadian claim, in the Province of Quebec, Canada, in accordance with the ADRC Arbitration Rules. Any outcome of such arbitration proceeding shall be final and binding upon the parties hereto.



System warranty!

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

See complete warranty on page 40.

