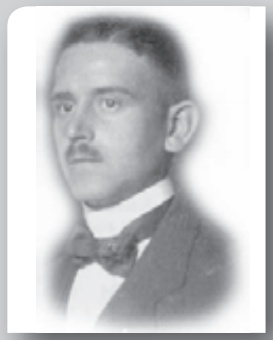
Niedax – the global leader in design, engineering, and production of cable tray systems – stands for a century of manufacturing excellence and pioneering innovation.

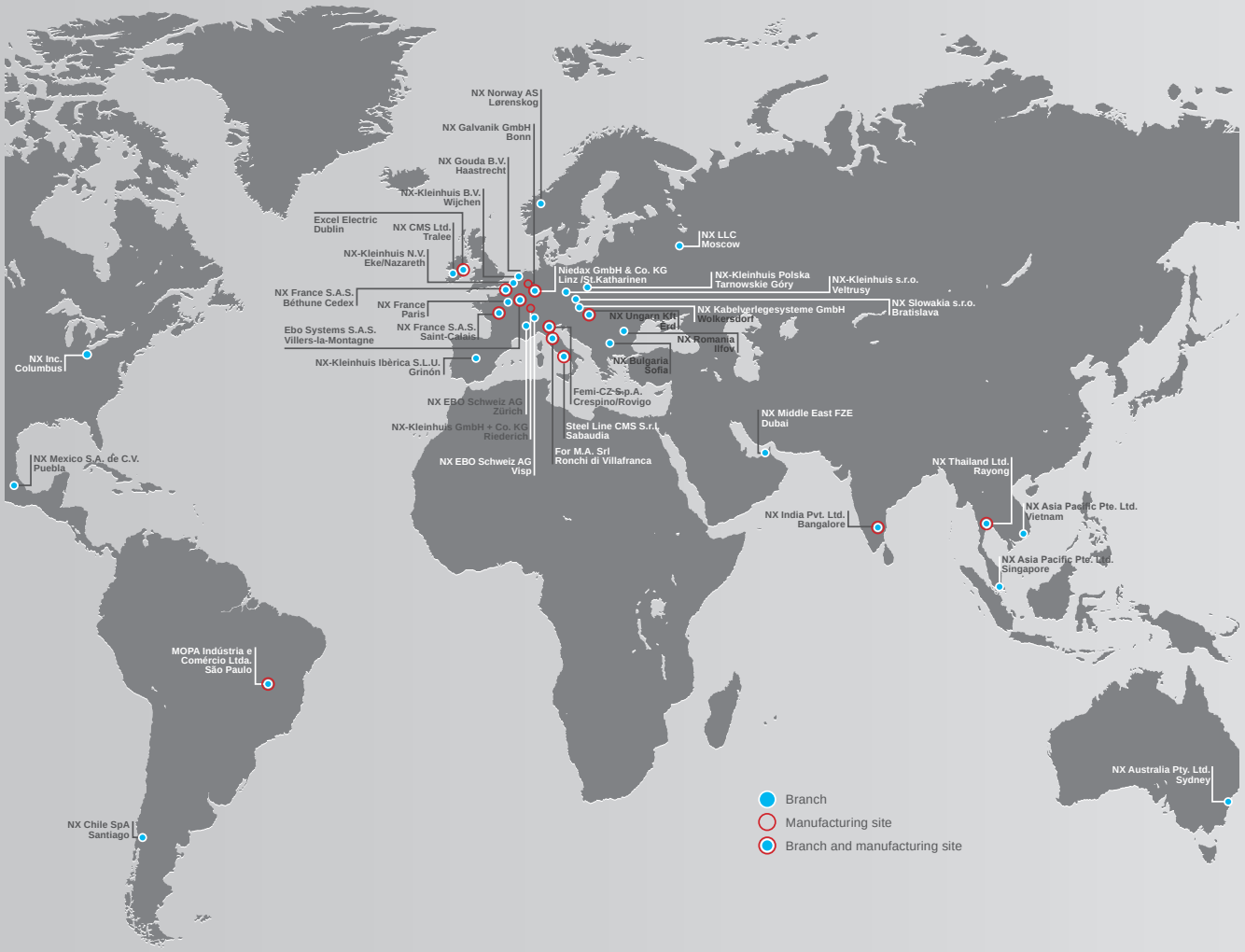
The company was established in 1920 by Alexander **Nied**ergesäß and Fritz **Ax**thelm, two German engineers who saw the rising demand for electricity. Today, 4 generations later, the NIEDAX GROUP is still family owned and operated.

Headquartered in Linz am Rhein (Germany), the Group currently employs a workforce of around 2000 people across the globe. Eighteen factories in eleven countries are manufacturing cable support systems under the wellknown brand names Niedax, Kleinhuis, Fintech, RICO, EBO, Niedax France, Gouda Holland, ACS, SteelLine, BVS, Excel Electrics and MOPA. Wholly owned subsidiaries in 30 countries and a network of 80 sales partners are supporting our customers with their technical and sales expertise as well as with their logistical capabilities.



Alexander Niedergesäß

Fritz Axthelm



NIEDAX GROUP

NIEDAX
- Steel Cable Trays
- Cable Channels
- Support Systems

Kleinhuis
- PVC Cable Glands
- PVC Cable Ducting
- PVC Pipe Clamps

FINTECH
- Aluminum Conduit
- Aluminum Ducting
- Metric Steel Conduit

RICO
- Steel Cable Trays
- Seismic Support Systems
- Engineering Services

NIEDAX France
- Aluminum and Steel Cable Tray Systems
- Wire Mesh trays

ebo
EBO Systems
- Fiber Reinforced Polyester Cable Tray Systems
- PVC Cable Trays

GoudaHolland
- Aluminum and Steel Cable Tray Systems
- Marine Cable Ladders

ACS
- Aluminum and Steel Cable Tray Systems
- Strut Support System

KT
- Engineering and Cable Tray Manufacturing Services for the Railway Industry

FEMI-CZ
SISTEMI PORTACAVI - CABLE TRAY SYSTEMS
- Aluminum and Steel Cable Tray Systems
- Wire Ducting

MOPA
- Perforated and Solid Steel Cable Trays
- Cable Ladder Systems
- Cable Tray Support Systems

EXCEL Electric Group
- British Standard Trunking
- Ventilated Steel Cable Trays
- Support Systems

Factory and central warehouse in Germany

Headquarters in Germany

North American Headquarters at 2970 Charter St. Columbus, OH USA

Warehouse

Warehouse

Warehouse

CERTIFICATE OF COMPLIANCE

Certificate Number	20120320-E233344
Report Reference	E233344-20030416
Issue Date	2012-MARCH-20
Issued to:	NIEDAX GMBH & CO KG ASBACHER STR 141 53545 LINZ AM RHEIN GERMANY
This is to certify that representative samples of	CABLE TRAYS General Coverage Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	ANSI/NFPA 70, "National Electrical Code" (NEC) CAN/CSA-C22.2 No. 126.1-09 Standard Metal Cable Tray Systems
Additional Information:	See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Classification Mark for the U.S. and Canada should be considered as being covered by UL's Classification and Follow-Up Service and meeting the appropriate U.S. and Canadian requirements.

The UL Classification Mark includes: the UL in a circle symbol: with the word "CLASSIFIED" (as shown); a control number (may be alphanumeric) assigned by UL; a statement to indicate the extent of UL's evaluation of the product; and the product category name (product identity) as indicated in the appropriate UL Directory. The UL Classification Mark for Canada includes: the UL Classification Mark for Canada: with the word "CLASSIFIED" (as shown); a control number (may be alphanumeric) assigned by UL; a statement to indicate the extent of UL's evaluation of the product; and the product category name (product identity) in English, French, or English/French as indicated in the appropriate UL Directory.

Look for the UL Classification Mark on the product.

William R. Carney, Director, North American Certification Programs

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at www.ul.com/contactus

Page 1 of 1

Electronically published by ABS Hamburg.
Reference T1747403, dated 01-JUN-2018.

ABS

CERTIFICATE NUMBER 18-HG1747403-PDA
EFFECTIVE DATE 01-June-2018
EXPIRATION DATE 31-May-2023
ABS TECHNICAL OFFICE
Hamburg Engineering Department

CERTIFICATE OF

Product Design Assessment

This is to certify that a representative of this Bureau did, at the request of

NIEDAX GmbH & Co. KG

located at

Asbacher Str. 141, D-53545 Linz am Rhein, Germany

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

Product Cable Supports

Model KLMUX 40, KLMUL 40, KLMUL(X) 40, KLMULL(X) 40, KLMZL(X) 40, KLMZLL(X) 40, RSX 60, RSX 85, RSX 110, RLX 60, RLX 85, RLX 110, RLUX 60, RLUX 85, RLUX 110, RSUX 60, RSUX 85, RSUX 110, GRSX 60, GRSX 110

This Product Design Assessment (PDA) Certificate remains valid until expiration date or until the Rules and/or Standards used in the assessment are revised or until there is a design modification warranting design reassessment (whichever occurs first).

Acceptance of product is limited to the "Intended Service" details prescribed in the certificate and as per applicable Rules and Standards.

This Certificate is valid for installation of the listed product on ABS units which exist or are under contract for construction on or previous to the effective date of the ABS Rules and standards applied at the time of PDA issuance. Use of the Product for non-ABS units is subject to agreement between the manufacturer and intended client.

American Bureau of Shipping

U. Numirski

Ulf Numirski
Engineer/Consultant

NOTE: This certificate evidences compliance with one or more of the Rules, Guides, standards or other criteria of ABS or a statutory, industrial or manufacturer's standards. It is issued solely for the use of ABS, its committees, its clients or other authorized entities. Any significant changes to the aforementioned product without approval from ABS will result in this certificate becoming null and void. This certificate is governed by ABS Rules 1-1-A3/5.9 Terms and Conditions of the Request for Product Type Approval and Agreement (2010)

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

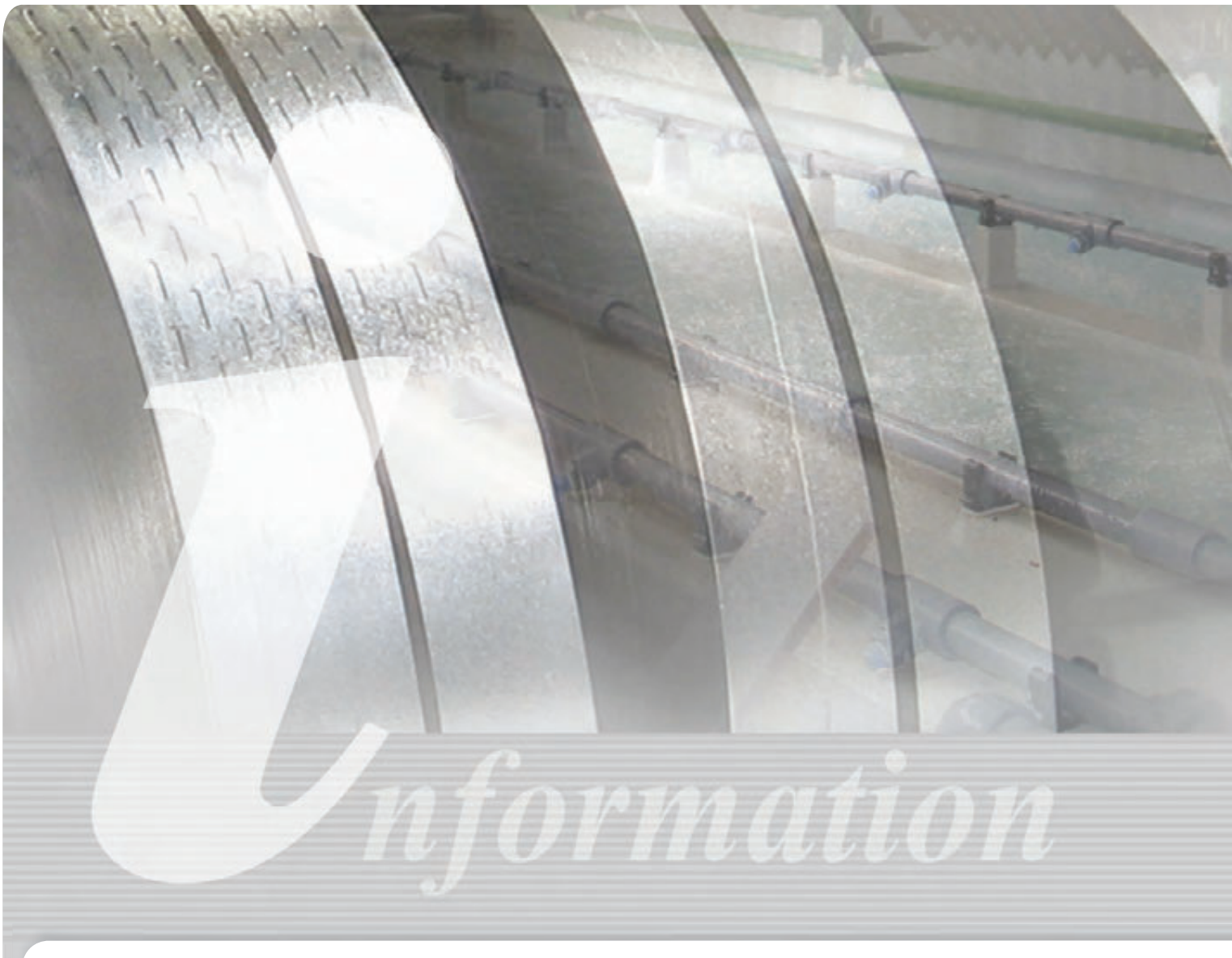
DIN EN IEC 61537:2007-09

is the Global Standard for Cable Tray and Cable Ladder Systems for Cable Management and specifies requirements and tests for cable tray systems (such as all metal cable trays including wire mesh cable tray and cable ladders) for the support, accommodation of cables and possibly other electrical equipment in electrical and/or communications systems installations.

All Niedax Support Systems are manufactured and tested in accordance with DIN EN IEC 61537 by Niedax Gmbh & Co. KG in Linz/Germany.
The safe working load as defined by the standard is the lowest value of either the load creating a deflection of L/20 at the end or the breaking load divided by 1.7 if the deflection is not reached.

All Niedax Cable Tray and Cable Ladder Systems are manufactured and tested in accordance with DIN EN IEC 61537 by Niedax Gmbh & Co. KG in Linz/Germany.
Testing is done with an equally balanced load and a splice located in the middle of the span. The safe working load is the smallest value of either the load creating a deflection of 1/100th of the span or the breaking load divided by 1.7. While the standard is requiring just 1/100th, Niedax is even more demanding and has reduced this figure to 1/200th.

NOTES



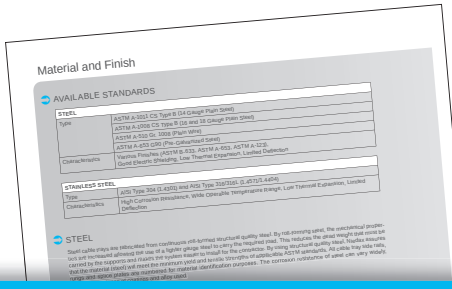
GENERAL INFORMATION

- Material Handling
- Finishes
- Corrosion Protection
- Installation Instructions

On the following pages we have compiled the most important information about our cable support systems for you.

For further information please contact us. Simply call us on +1 614 921 8469 or send an e-mail to sales@niedaxusa.com.

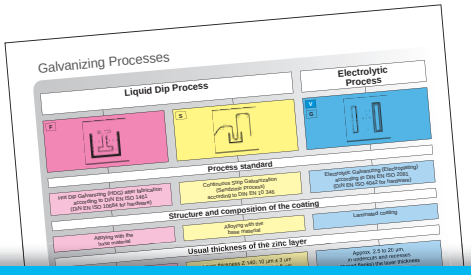
Material and Finish


Material and Finish
AVAILABLE STANDARDS
STEEL
STAINLESS STEEL
STEEL

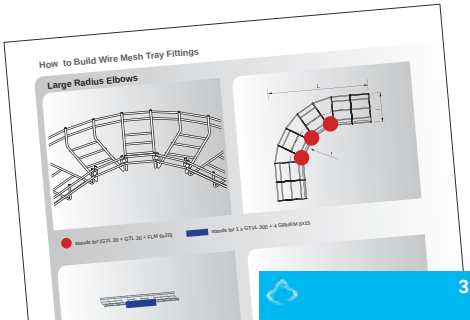
Fittings Installation

Fittings Installation
RECOMMENDED SUPPORT LOCATIONS FOR FITTINGS
HORIZONTAL ELBOW SUPPORT

Galvanizing Processes


Galvanizing Processes
Liquid Dip Process
Electrolytic Process
Process standard
Structure and composition of the coating
Usual thickness of the zinc layer

Installation Instructions


How to Build Wire Mesh Tray Fittings
Large Radius Elbows

WARNING!

Cable tray should not be used as a walkway, ladder, or support for people; cable tray is a mechanical support system for cables and raceways. Using cable trays as a walkway can result in personal injury and also cause damage to the cable tray system and installed cables.

Hazardous voltages in electrical equipment can cause severe personal injury or death. Safety related work practices, as described in NFPA 70E, Part 11 or VDE 0100, should be followed at all times.

The overall performance of a cable tray wiring system is dependent upon proper installation, including supports and cables.

Non-adherence to installation and maintenance guidelines may lead to personal injury as well as damage to property.

Installation and proper maintenance of cable tray wiring systems should be performed only by qualified personnel. For the purposes of this guideline, a qualified installer is one who is familiar with electrical construction. In addition, the person should be:

Trained and authorized to test, energize, clear, ground, tag, and lockout circuits in accordance with established safety practices.

Trained in the proper care and use of protective equipment such as insulated rubber gloves, hardhats, safety glasses or face shields, dust masks and flash resistant clothing in accordance with established safety practices and / or local building codes.

RECEIVING AND UNLOADING

Cable tray is generally bundled and shipped on extended pallets weighing up to 5.500 pounds. Please make sure that proper unloading equipment (e.g. forklift with extended forks) is available.

Inventory all items immediately after unloading and note on the bill of lading any shortage or shipping damage.

STORAGE

Aluminum, Fiberglass, Stainless Steel and /or other non-metallic cable tray can be stored outside without protective covering. Tray should be loosely stacked, elevated off the ground, and ventilated to prevent storage stain. If appearance is important, cable tray should be stored indoors to prevent water or other environmental factors from staining or adhering to cable tray.

Hot dipped galvanized after fabrication (H.D.G.A.F.), mill galvanized or electro-galvanized cable tray must be protected or stored in a well ventilated, dry location.

Bare steel cable tray should receive a protective coating as soon as possible to prevent surface rust.

PVC or painted cable tray should be protected and stored indoors if possible. Cable tray must be protected from scratching and marring of finish.

SPAN/LOAD CLASS DESIGNATION - USA

NEMA CLASS	SUPPORT SPAN		MAX. LOAD	
	m	ft.	kg/m	lb./ft.
5 AA	1,5	5	37	25
5 A	1,5	5	74	50
8 AA	2,4	8	37	25
8 A	2,4	8	74	50
8 B	2,4	8	112	75
8 C	2,4	8	149	100
10 AA	3,0	10	37	25
10 A	3,0	10	74	50
12 AA	3,7	12	37	25
12 A	3,7	12	74	50
12 B	3,7	12	112	75
12 C	3,7	12	149	100
20 AA	6,0	20	37	25
20 A	6,0	20	74	50
20 B	6,0	20	112	75
20 C	6,0	20	149	100

SPAN/LOAD CLASS DESIGNATION - CANADA

NEMA CLASS	DESIGN LOAD		SUPPORT SPACING	
	kg/m	lb./ft.	m	ft.
A	99	67	1,5	5
A	37	25	3,0	10
C	259	174	1,5	5
C	97	65	3,0	10
D	179	120	3,0	10
D	67	45	6,0	20
E	299	200	3,0	10
E	112	75	6,0	20

The designer of the installation should take into consideration the effects of snow, wind and other environmental forces where necessary.

Material and Finish

AVAILABLE STANDARDS

STEEL	
Type	ASTM A-1011 CS Type B (14 Gauge Plain Steel)
	ASTM A-1008 CS Type B (16 and 18 Gauge Plain Steel)
	ASTM A-510 Gr. 1008 (Plain Wire)
	ASTM A-653 G90 (Pre-Galvanized Steel)
Characteristics	Various Finishes (ASTM B-633, ASTM A-653, ASTM A-123), Good Electric Shielding, Low Thermal Expansion, Limited Deflection

STAINLESS STEEL	
Type	AISI Type 304 (1.4301) and AISI Type 316/316L (1.4571/1.4404)
Characteristics	High Corrosion Resistance, Wide Operable Temperature Range, Low Thermal Expansion, Limited Deflection

STEEL

Steel cable trays are fabricated from continuous roll-formed structural quality steel. By roll-forming steel, the mechanical properties are increased allowing the use of a lighter gauge steel to carry the required load. This reduces the dead weight that must be carried by the supports and makes the system easier to inslall for the contractor. By using structural quality steel, Niedax assures that the material (steel) will meet the minimum yield and tensile strengths of appilicable ASTM standards. All cable tray side rails, rungs and splice plates are numbered for material identification purposes. The corrosion resistance of steel can vary widely, depending on types of coatings and alloy used.

STAINLESS STEEL

Stainless Steel cable trays are fabricated from continuous roll-formed AISI Type 304 and 316 stainless steel. They are nonmagnetic and belong to the group called austenitic stainless steels. Like carbon steel, they exhibit increased strength when cold worked by roll-forming or bending. Several important factors make the use of stainless steel imperative. Considerations such as: long term maintenance costs, corrosion resistance, appearance and locations where product contamination is undesirable, are key factors in determining the necessity of Stainless Steel Material. Stainless Steel exhibits stable structural properlies such as yield strength and high creep strength at elevated temperatures. Niedax Stainless Stell cable trays are welded using stainless steel welding wire to ensure that each weld exhibits the same corrosion resistant characteristic as the base metal. A detailed study of the corrosive environment is recommended when considering a stainless steel design.

ZINC COATINGS

Zinc protects steel in two ways. First, it acts as a protective coating and secondly, as a sacrificial anode to repair bare areas such as cut edges, scratches, and gouges. The corrosion protection of zinc is directly related to its thickness and the environment. i.e, a .2 mil coating will last twice as long as a .1 mil coating in the same environment. Galvanizing also protects cut and drilled edges.

ELECTROGALVANIZED ZINC

Electrogalvanized Zinc (also known as zinc plated or electroplated) is the process by which a coating of zinc is deposited on the steel by electrolysis from a bath of zinc salts. This finish is standard for cable tray hardware and some accessories for pre-galvanized systems. When exposed to air and moisture, zinc forms a tough , adherent, protective film consisting of a mixture of zinc oxides, hydroxides, and carbonates. This film is in itself a barrier coating which slows subsequent corrosive attack on the zinc. This coating is usually only recommended for indoor use in relatively dry areas, as it provides limited protection (ninety-six hours of protection insalt spray testing per ASTM 8117).

PRE-GALVANIZED ZINC

(Mill galvanized, hot dip mill galvanized or continuous hot dip galvanized)

Pre-Galvanized steel is produced by coating coils of sheet steel with zinc. This process is accomplished by continuously rolling the material through molten zinc at the mills. This procedure is also used to produce mill galvanized and hot dip mill galvanized material. The coils are then slit to size and fabricated by roll forming, shearing, punching, or forming to produce Niedax pre-galvanized cable tray products. The G90 specification calls for a coating of .90 ounces of zinc per square foot of steel. This results in a coating of .45 ounces per square foot on each side of the sheet. This is important when comparing this finish to hol dip galvanized after fabrication. During fabrication, cut edges and welded areas are not normally zinc coated; however, the zinc located near the uncoated metal becomes a sacrificial anode to protect the bare areas within a short period of time.

HOT DIP GALVANIZED AFTER FABRICATION

(Hot dip galvanized or batch hot dip galvanized)

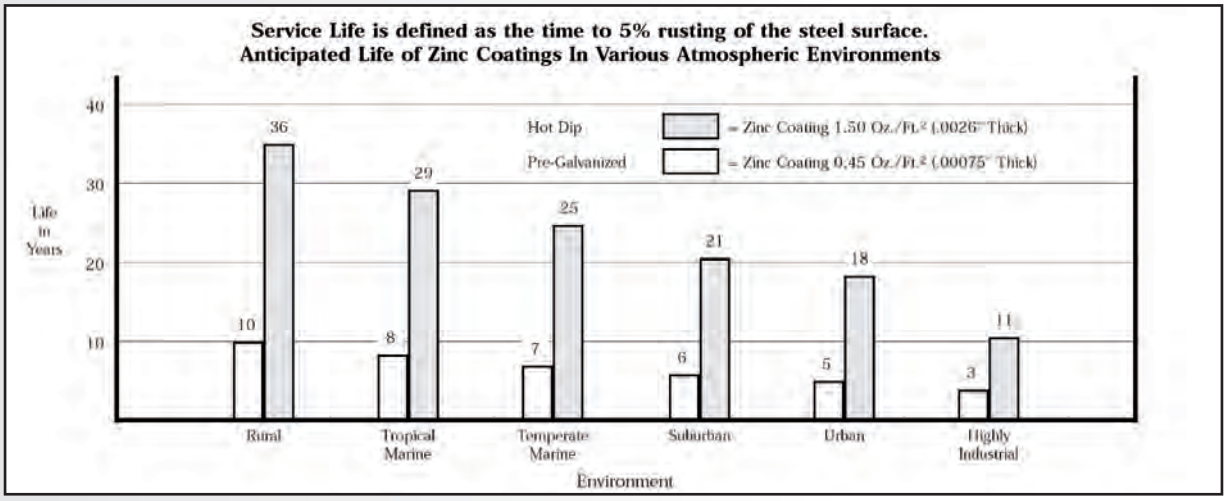
Hot Dip Galvanized After Fabrication cable tray products are fabricated from steel and then completely immersed in a bath of malten zinc. A metallic bond occurs resulting in a zinc coating that completely coats every surface, including edges and welds.

A key advantage of this method is coating thickness. Cable trays that are hot dip galvanized after fabrication have a minimum thickness of 1.50 ounces per square foot on each side, or a total of 3.0 ounces per square foot of steel, according to ASTM A123.

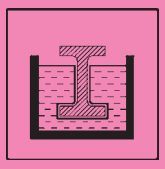
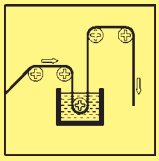
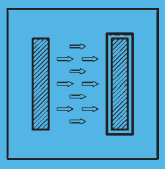
The zinc thickness can be controlled by the amount of time each part is immersed in the molten zinc bath as weil as the speed at which it is removed.

The layer of zinc which bonds to the steel provides a dual protection against corrosion. It protects first as an overall barrier coating. If this coating happens to be scratched or gouged, zinc‘s secondary defense, galvanic action is called upon to protect the steel.

Hot dip galvanized after fabrication is recommended for prolonged outdoor exposure and will protect steel for many years in most outdoor environments as well as in many aggressive industrial environments.



Galvanizing Processes

	Liquid Dip Process		Electrolytic Process
	F 	S 	V G 
Process standard	Hot Dip Galvanizing (HDG) after fabrication according to DIN EN ISO 1461 (DIN EN ISO 10684 for hardware)	Continuous Strip Galvanization (Sendzimir Process) according to DIN EN 10 346	Electrolytic Galvanizing (Electroplating) according to DIN EN ISO 2081 (DIN EN ISO 4042 for hardware)
Structure and composition of the coating	Alloying with the base material	Alloying with the base material	Laminated coating
Usual thickness of the zinc layer	Depending on the thickness of the material to be galvanized, up to 1.5 mm thickness approx. 45 µm, up to 3 mm thickness approx. 55 µm, up to 6 mm thickness approx. 70 µm	Layer thickness Z 140: 10 µm ± 3 µm Layer thickness Z 275: 20 µm ± 5 µm according to DIN EN 10 346	Approx. 2.5 to 20 µm, in undercuts and recesses (thread flanks) the layer thickness is less than on open surfaces
Special features	Each component is individually dipped in the liquid zinc bath. The zinc washes over the entire surface. Hollow sections are protected on the in- and outside. Rigid corrosion protection	The corrosion protection layer is applied to the surface by passing the steel as a continuous ribbon through a bath of molten zinc.	The zinc layer is deposited from an aqueous electrolyte by means of DC current. Post-treatment is generally applied to improve the protective effect. Decorative visual appearance, smooth surface with no edges and burrs. 3
Distinguishing features	The surface is relatively rough, and solidified zinc may block small holes. Newly galvanized surfaces are bright shining; high temperature galvanized part such as screws are grey.	Smooth surface depending on the process, slightly greased. Holes and cut edges expose “bare metal”. Corrosion protection of “bare” edges up to 2 mm material thickness is provided by the by cathodic protection effect. 1	Iridescent shimmer, bright and shiny surface after passivation.
Usage - Application	Welded components, equipment exposed to the weather.	Non-welded components up to 2 mm thick, especially for interior building work.	For parts in almost all shapes and sizes, corrosion protection and decorative finish. Recommended for dry, indoor areas only.
Corrosion Protection (typical annual degredation for Central Europe)	Depending on the atmospheric conditions and the local environment. Rural 0.1 - 1.0 µm Suburban 1.0 - 2.0 µm Marine 2.0 - 4.0 µm 2	Annual degradation almost unmeasurable in dry indoor areas without pollution.	**Corrosion Protection** Salt spray tests according to DIN EN ISO 9227 NSS show up to 360 hours before rusting depending on the thickness of the zinc layer and the passivation method.

1 Components over 2 mm in material thickness are hot dip galvanized at Niedax

2 Local environmental conditions would be for instance the direct corrosive effect of a chimney with CO_2 flue gases.

3 Chromating process is ROHS compliant.

Corrosion

All metal surfaces are affected by corrosion. Depending on the physical properties of the metal and the environment to which it is exposed, chemical or electromechanical corrosion may occur.

ATMOSPHERIC CORROSION

Atmospheric corrosion occurs when metal is exposed to airborne liquids, solids or gases. Some causes of atmospheric corrosion are moisture, salt, dirt and sulphuric acid. This form of corrosion is typically worse outdoors, especially near marine environments.

CHEMICAL CORROSION

Chemical corrosion takes place when metal comes in direct contact with a corrosive solution. Some factors which affect the severity of chemical corrosion include: chemical concentration level, duration of contact, frequency of washing, and operating temperature.

STORAGE CORROSION

Wet storage stain (White rust) is caused by the entrapment of moisture between the surfaces of closely packed and poorly ventilated materials for an extended period of time. Wet storage stain is usually superficial, having no affect on the properties of the metal.

Light staining normally disappears with weathering. Medium to heavy buildup should be removed, in order to allow the formation of the normal protective film.

Proper handling and storage will help to assure stain-free material. If product arrives wet, it should be unpacked and dried before storage. Dry material should be stored in a well ventilated “low moisture“ environment to avoid condensation. Outdoor storage is undesirable, and should be avoided whenever possible.

GALVANIC CORROSION

Galvanic corrosion occurs when two or more dissimilar metals are in contact while in the presence of an electrolyte (ie. moisture). An electrolytic cell is created and the metals form an anode or a cathode depending on their relative position on the Galvanic Series Table. The anodic material will be the one to corrode. Whether a material is anodic depends on the relative position of the other material. For example: If zinc and steel are in contact, the zinc acts as the anode and will corrode; the steel acts as the cathode, and will be protected. If steel and copper are in contact, the steel is now the anode and will corrode.

The rate at which galvanic corrosion occurs depends on several factors:

1. The amount and concentration of electrolyte present – Material stored in an indoor, dry environment will have little or no galvanic corrosion compared to a wet atmosphere.
2. The relative size of the materials – A small amount of anodic material in contact with a large cathodic material will result in greater corrosion. Likewise, a large anode in contact with a small cathode will decrease the rate of corrosive attack.
3. The relative position on the Galvanic Series Table. The farther apart in the Galvanic Series Table, the greater the potential or corrosion of the anodic material.

It is very important to consider the effects of electrolytic corrosion when selecting the assembly hardware. Ideally the finish of cable tray and hardware should be identical. But if this is not possible the relatively small hardware should always be higher grade than the large volume tray, e.g. use stainless steel bolts for hot dip galvanized tray but not the other way round.

Corrosion Guide

Chemical	Cable Tray Material					
	Stainless Type 304			Stainless Type 316		
	Cold	Warm	Hot	Cold	Warm	Hot
Acetone	R	R	R	R	R	R
Aluminum Chloride Solution	NR	–	–	F	–	–
Anhydrous Aluminum Chloride	NR	–	–	F	–	–
Aluminum Sulfate	R	R	R	R	R	R
Ammonium Chloride 10%	R	R	R	R	R	R
Ammonium Hydroxide	R	R	R	R	R	R
Ammonium Phosphate	R	–	–	R	–	–
Ammonium Sulfate	R	R	R	R	R	R
Ammonium Thiocyanate	R	–	–	R	R	R
Amyl Acetate	R	R	R	R	R	R
Amyl Alcohol	R	–	–	R	R	R
Arsenic Acid	R	R	–	R	R	R
Barium Chloride	R	R	R	R	R	R
Barium Sulfate	R	R	–	R	R	–
Barium Sulfide	R	R	–	R	R	–
Benzene	R	R	R	R	R	R
Benzoic Acid	R	R	R	R	R	R
Boric Acid	R	R	R	R	R	R
Bromine Liquid or Vapor	NR	NR	NR	NR	NR	NR
Butyl Acetate	R	–	–	R	R	R
Butyl Alcohol	R	R	R	R	R	R
Butyric Acid	R	R	R	R	R	R
Calcium Chloride 20%	R	–	–	R	–	–
Calcium Hydroxide	R	R	F	R	R	R
Calcium Hypochlorite 2 - 3%	R	–	–	R	–	–
Calcium Sulfate	R	R	–	R	R	–
Garbon Monoxide Gas	R	R	R	R	R	R
Garbon Tetrachloride	F	F	F	R	R	R
Chloroform Dry	R	R	–	R	R	–
Chloroform Solution	–	–	–	–	–	–
Chromic Acid 10% CP	R	R	F	R	R	R
Citric Acid	R	R	NR	R	R	R
Copper Cyanide	R	R	R	R	R	R
Copper Sulfate 5%	R	R	R	R	R	R
Ethyl Alcohol	R	R	R	R	R	R
Ethylene Glycol	R	R	–	R	R	R
Ferric Chloride	NR	NR	NR	NR	NR	NR
Ferrous Sulfate 10%	R	R	–	R	R	–
Formaldehyde 37%	R	R	R	R	R	R
Formic Acid 10%	R	R	NR	R	R	R
Gallic Acid 5%	R	R	R	R	R	R
Hydrochloride Acid 25%	NR	NR	NR	NR	NR	NR
Hydrofluoric Acid 10%	NR	NR	NR	NR	NR	NR

R = Recommended
F = May be used under some conditions
NR = Not Recommended
– = Information not available

Cold = 50 - 80°F
Cold = 10 - 27°F

Warm = 130 - 170°F
Warm = 54 - 77°F

Hot = 200 - 212°F
Hot = 93 - 100°F

The corrosion data given in this table is for general comparison only. (Reference Gorrasion Resistance Tables, Second Edition)
The presence of contaminates in chemical environments can greatly affect the corrosion rate of any material.

Chemical	Cable Tray Material					
	Stainless Type 304			Stainless Type 316		
	Cold	Warm	Hot	Cold	Warm	Hot
Hydrogen Peroxide 30%	R	R	R	R	R	R
Hydrogen Sulfide Wet	NR	NR	R	R	R	R
Lactic Acid 10%	R	R	F	R	R	R
Lead Acetate 5%	R	R	R	R	R	R
Magnesium Chloride 1%	R	F	R	–	R	R
Magnesium Hydroxide	R	R	–	R	R	–
Magnesium Nitrate 5%	R	R	R	R	R	R
Nickel Chloride	R	–	–	R	–	–
Nitric Acid 15%	R	R	R	R	R	R
Oleic Acid	R	R	F	R	R	R
Oxalic Acid 10%	NR	NR	NR	R	R	R
Phenol CP	R	R	R	R	R	R
Phosphoric Acid 50%	R	R	R	R	F	NR
Potassium Bromide 100%	R	R	–	R	R	R
Potassium Carbonate 100%	R	R	R	R	R	R
Potassium Chloride 5%	R	R	R	R	R	R
Potassium Dichromate	R	R	R	R	R	R
Potassium Hydroxide 50%	R	R	R	R	R	R
Potassium Nitrate 50%	R	R	R	R	R	R
Potassium Sulfate 5%	R	R	R	R	R	R
Propyl Alcohol	R	R	R	R	R	R
Sodium Acetate 20%	R	R	R	R	R	R
Sodium Bisulfate 10%	R	R	R	R	–	–
Sodium Borate	R	R	R	R	R	R
Sodium Carbonate 18%	R	R	R	R	–	–
Sodium Chloride 5%	R	R	R	R	R	–
Sodium Hydroxide 50%	R	R	R	R	R	R
Sodium Hypochlorite 5%	F	–	–	R	–	–
Sodium Nitrate 100%	R	R	R	R	R	R
Sodium Nitrite 100%	R	R	R	R	R	R
Sodium Sulfate 100%	R	R	R	R	R	R
Sodium Thiosulfate	R	R	R	R	R	R
Sulfur Dioxide (Dry)	R	R	R	R	R	R
Sulfuric Acid 5%	F	NR	NR	R	–	–
Sulfuric Acid 10%	NR	NR	NR	NR	NR	NR
Sulfuric Acid 50%	NR	NR	NR	NR	NR	NR
Sulfuric Acid 75 - 98%	NR	NR	NR	NR	NR	NR
Sulfuric Acid 98 - 100%	NR	NR	–	R	R	F
Tannic Acid 10% and 50%	R	R	R	R	R	R
Tartaric Acid 10% and 50%	R	R	R	R	R	R
Vinegar	R	R	R	R	R	R
Zinc Chloride 5% and 20%	R	F	NR	R	R	R
Zinc Nitrate	R	R	R	R	R	R
Zinc Sulfate	R	R	R	R	R	R

Mechanical Properties

LENGTHS AVAILABLE

The current Cable Tray Standard, NEMA VE-1 and C22.2 No. 126.1-98, lists typical lengths as 3000 mm (10 ft), 3660 mm (12 ft), 6000 mm (20 ft), and 7320 mm (24 ft). It is impractical to manufacture either lighter systems in the longer lengths or heavier systems in the shorter lengths. For that reason, Niedax has introduced a primary and secondary length for some systems. These straight section lengths were selected to direct the user to trays that best suit support span demands and practical loading requirements. The primary length is the one that is the most appropriate for the strength of the system and that will provide the fastest service levels. The secondary lengths will be made available to service additional requirements. Special lengths are available upon request with extended lead times.

The VE-2, Cable Tray Installation Guide, states that the support span shall not be greater than the straight section length. If a 20C system is manufactured in 12 foot sections the greatest span for supports would be 12 feet. This dramatically affects the loading of the system.

$W_1 \times L_1^2 = W_2 \times L_2^2$

$100 \times 20^2 = W_2 \times 12^2$

$40{,}000 = 144 \times W_2$

$W_2 =$ 277 lbs. per foot

SUPPORT SPAN

The strength of a cable tray system is largely determined by the strength of its side rails. The strength of a cable tray side rail is proportionate to the distance between the supports on which it is installed, commonly referred to as the “support span“. Therefore, the strength of a cable tray system can be altered by changing the support span. However, there is a limit to how much that strength can be increased by reducing the support span. At a certain point the strength of the bottom portion of the cable tray could become the determining factor of strength.

Once the load requirement has been determined, the following factors should be considered:

1. Sometimes the location of existing structural beams will dictate the cable tray support span. This is typical with outdoor installations where adding intermediate supports could be financially prohibitive. For this situation the appropriate cable tray must be selected to accommodate the existing span.

2. When cable tray supports are randomly located, the added cost of a higher strength cable tray system should be compared to the cost of additional supports.

3. The support span lengths should be equal to or less than unspliced straight section lengths, to ensure that no more than one splice is placed between supports.

The distance between the supports affects the loading capabilities exponentially. To calculate loading values not listed use:

$W_1 \times L_1^2 = W_2 \times L_2^2$ where

W_1 = tested loading

L_1 = span in feet, a tested span

W_2 = loading in question

L_2 = known span for new loading

Other Loads - Ice, wind, snow for outdoor systems see page 41 and 42 for information.

A 200 lb. concentrated load for industrial systems. The affect of a concentrated load can be calculated as follows:

2 x (concentrated static load) / span in feet

When considering concentrated loads the rung strength should be factored in.

DEFLECTION

Deflection in a cable tray system is primarily an aesthetic consideration. When a cable tray system is installed in a prominent location, a maximum simple beam deflection of 1/200 of support span can be used as a guideline to minimize visual deflection.

It is important at this point to mention that there are two typical beam configurations, simple beam and continuous beam, and to clarify the difference.

A good example of a simple beam is a single straight section of cable tray supported, but not fastened at either end. When the tray is loaded the cable tray is allowed to flex. Simple beam analysis is used almost universally for beam com parisons even though it is hardly practical in the field. The three most prominent reasons for using a simple beam analysis are: calculations are simplified; it represents the worst case loading; and testing is simple and reliable.

Continuous beam is the beam configuration most commonly used in cable tray installations. An example of this configuration is where cable trays are installed across several supports to form a number of spans. The continuous beam possesses traits of both the simple and fixed beams. When equal loads are applied to all spans simultaneously, the counter-balancing effect of the loads on both sides of a support restricts the movement of the cable tray at the support. The effect is similar to that of a fixed beam.

The end spans behave substantially like simple beams. When cable trays of identical design are compared, the continuous beam installation will typically have approximately half the deflection of a simple beam of the same span. The published load data in the NIEDAX cable tray catalog is based on the continuous beam analysis per IEC - Standard 61537. Therefore simple beam data should be used only for general comparison purposes.

Please note that NEMA Standards VE-1 limits the use of splice plates as follows:

Unspliced straight sections should be used on all simple spans and on end spans of continuous span runs. Straight section lengths should be equal to or greater than the span length to ensure not more than one splice between supports.

CONCENTRATED LOADS

A concentrated static load represents a static weight applied at a single point between the side rails. Tap boxes, conduit attachments and long cable drops are just some of the many types of concentrated loads. When specified, these concentrated static loads may be converted to an equivalent, uniform load (We) by using the following formula:

We = 2 x (concentrated Static Load) / span length

However, it should be noted that per NEMA Standard Publication VE1 cable tray is designed as a support for power or control cables, or both, and is not intended or designed to be a walk-way for personnel.

POWER CABLING LOADS

Power applications can create the heaviest loading. The heaviest cable combination found was for large diameter cables (i.e. steel armor, 600V, 4 conductor 750 kcmil). The cables weigh less than 3.8 lbs. per inch-width of cable tray. As power cables are installed in a single layer, the width of the cable affects the possible loading.

DATA/COMMUNICATION CABLING LOADS

Low voltage cables can be stacked as there are no heat generation problems. The NEC employs a calculation of the total cross sectional area of the cables not exceeding 50% of the fill area of the cable tray. As the cable fill area of the cable tray system affects the possible loading, both the loading depth and width of the systems must be considered. For this example 4UTP category 5 cable (O.D. = .21, .026 lbs./ft.) were used.

Mechanical Properties

ENVIRONMENTAL LOADS: WIND

Wind loads need to be determined for all outdoor cable tray installations. Most outdoor solutions are ladder type trays, therefore the most severe loading to be considered is impact pressure normal to the cable tray side rails. The impact pressure corresponding to several wind velocities are given below in Table 1.

Table 1: Impact Pressures

V(mph)	P(lbs/ft²)	V(mph)	P(lbs/ft²)
15	0.58	85	18.5
20	1.02	90	20.7
25	1.60	95	23.1
30	2.30	100	25.6
35	3.13	105	28.2
40	4.09	110	30.9
45	5.18	115	33.8
50	6.39	120	36.8
55	7.73	125	40.0
60	9.21	130	43.3
65	10.80	135	46.6
70	12.50	140	50.1
75	14.40	145	53.8
80	16.40	150	57.6

V= Wind Velocity P= Impact Pressure

Note: These values are for an air density of 0.07651lbs/ft3 corresponding to a temperature of 16°C (60° F) and baro-metric pressure of 14.7 lbs/in^2.

Example Calculation:

Side load for 6“ side rail with 100 mph wind (25.6 x 6)/12 = 12.8 lbs/ft
When covers are installed on outdoor cable trays, another factor to be considered is the aerodynamic effect which can produce a lift strong enough to separate a cover from a tray. Wind moving across a covered tray creates a positive pressure inside the tray and a negative pressure above the cover. This pressure difference can remove the cover from the tray.

ENVIRONMENTAL LOADS: ICE

Glaze ice is the most commonly seen form of ice build-up. It is the result of rain or drizzle freezing on impact with an exposed object. Generally, only the top surface (or the cover) and the wind bearing side of a cable tray system is significantly coated with ice. The maximum design load to be added due to ice should be calculated as follows:

$L_I = (W \times T_I \times D_I) / 144$ where;
L_I = Ice Load (lbs/linear foot)
W = Cable Tray Width (inches)
T = Maximum Ice Thickness (inches)
D_I = Ice Density = 57 lbs/ft^3

the maximum ice thickness will vary depending on location. A thickness of ½“ can be used as a conservative standard.

Example Calculation:

Ice Loads for 24“ wide tray with ½“ thick ice; (24 x 0.5 x 57) / 144 = 4.75 lbs/ft

ENVIRONMENTAL LOADS: SNOW

Snow is measured by density and thickness. The density of snow varies almost as much as its thickness. The additional design load from snowfall should be determined using the building codes which apply for each installation.

NOTES

Plastic / Elastomer

PLASTIC CHANGES

their properties with temperature fluctuations. For this reason, plastic/elastomer articles should be stored below freezing in a warmer environment before processing to ensure full functionality.

Catalogue icon	Abbr	Material description	Operating temperature range	Mechanical properties	Range of application (examples)	Stress cracking
K01	PA	Polyamide, halogen-free	-30°C to 80°C	stiff, hard, very solid, very tough, abrasion-resistant	Cable glands, collecting holder, cable bracket, plug terminals	low
K02	PS	Polystyrene, halogen-free	-30°C to 60°C	brittle, notch-sensitive, stiff, very hard	Cable glands, row clamps, counter trough	powerful
K03	PE	Polyethylene, halogen-free	-40°C to 80°C	soft to stiff, tough, low strength	Protective caps, round clamps, counter trough	powerful
K04	PP	Polypropylene, halogen-free	-40°C to 90°C	form stiff, hard, solid, lower notched impact strength	Terminal housings, pipe clamps, nail clamps	possible
K05	PC	Polycarbonate, halogen-free	-40°C to 120°C	high strength, hardness and toughness, impact-resistant	Terminal housing	possible
K06	SBR/ NBR	Styrene butadiene nitrile rubber, halogen-free	-30°C to 100°C	good abrasion and weather resistance	Sealing rings	no
K07	CR	Neoprene (Chloroprene rubber), halogenated	-40°C to 120°C	good weather, chemical and ageing resistance	Sealing rings	no
K08	NBR	Nitrile butadiene rubber, halogen-free	-40°C to 120°C	flexible at low temperatures, high impact elasticity, low weather resistance	Sealing rings	no
K09	PVC	Polyvinyl chloride hard, halogenated	-20°C to 65°C	solid, stiff, hard, low notch sensitivity	Plastic ducts	low
K10	Soft PVC	Polyvinyl chloride soft, halogenated	0°C to 50°C	flexible, soft, good abrasion resistance	Protective caps	no
K11	ABS	Acrylonitrile butadiene styrene, halogen-free	-30°C to 80°C	very tough even with low temperatures, hard, stiff, scratch-resistant	Mounting plates, fittings for plastic ducts	low
K12	ASA	Acrylic acid ester-styrene-acrylonitrile graft copolymer, halogen-free	-30°C to 85°C	impact resistant even in the cold, strength similar to ABS	Device tank housing	low
K14	POM	Polyoxymethylene, halogen-free	-40°C to 100°C	solid, stiff, tough, also at high temperatures, elastic spring behaviour	Cable brackets	few
K15	SBR	Styrene butadiene rubber, halogen-free	-50°C to 100°C	high abrasion resistance, good heat and cold resistance	Sealing rings	no
K16	CR/ NBR	Chloroprene / Nitrile butadiene rubber, halogenated	-20°C to 100°C	high impact elasticity, improved weather resistance	Sealing rings	no
K17	CR/ SBR	Chloroprene / Styrene butadiene rubber, halogenated	-20°C to 70°C	high abrasion resistance, lower heat and cold-resistance	Sealing rings	no
K18	TPE	Theromplastic elastomers, halogen-free	-40°C to 120°C	very good resistance to weathering, ozone and ageing	Sealing rings	no
K19	FS 31	Moulding material 31 (Phenolic resin), halogen-free	to 125°C	high strength, high hardness, high temperature resistance	Illumination sockets	low
K20	SI	Silicone rubber, halogen-free	-40°C to 180°C	good ageing and high temperature stability	Sealing rings	no
K21	PUR	Polyurethanes, halogen-free	-25°C to 60°C	high tensile strength, buckling and abrasion resistance	Industrial hoses, seals, adhesives	low
K22	PET	Polyethylene terephthalate, halogen-free	-40°C to 190°C	high strength, very low moisture absorption	Illumination sockets	low
K23	UP-GF	Glass fiber reinforced polyester, halogen-free	-50°C to 180°C	high strength, high hardness, high temperature resistance	Cable duct, handrail, construction profiles	low
K24	PBT	Polybutylene terephthalate, halogen-free	-50°C to 150°C	high strength, high abrasion resistance, good chemical resistance	Illumination sockets	no

The information on halogen-free properties is based on searches of the relevant technical literature or supplier information. The statements always refer to chemically pure materials without flame-retardants. Tests according to DIN VDE 0604-2-100 have not been carried out.

CHEMICAL RESISTANCES

Catalogue icon	Water	Acids (10 %)	Alkalis (10 %)	Alcohol (ethanol)	Petrol	Benzene	Mineral oil	Vegetable and animal fats	Solvent
K01	+	o	+	+	o	+	o	+	o
K02	+	o	+	+	-	-	o	o	+
K03	+	+	+	+	o	-	o	+	-
K04	+	+	+	+	o	o	+	+	o
K05	+	o	-	+	-	-	+	+	o
K06	+	o	o	+	-	-	o	o	o
K07	+	-	-	+	o	+	o	o	o
K08	+	o	+	+	+	o	+	o	o
K09	+	+	+	+	+	-	+	+	-
K10	+	+	o	+	-	N/A	-	0	-
K11	+	o	N/A	+	-	-	+	-	-
K12	+	o	o	+	-	-	+	+	-
K14	+	o	o	+	+	+	+	+	-
K15	+	+	+	+	-	-	-	-	o
K16	+	o	o	+	o	-	+	+	o
K17	+	o	o	N/A	-	-	o	N/A	N/A
K18	+	+	+	N/A	+	N/A	+	N/A	-
K19	+	o	o	+	+	o	+	N/A	o
K20	+	o	o	+	o	-	+	+	o
K21	+	-	-	N/A	+	N/A	+	+	o
K22	+	+	o	+	+	o	+	N/A	o
K23	+	+	+	+	+	o	+	+	+
K24	+	o	+	+	+	o	+	+	o

+ = constant o = conditionally constant - = inconstantly N/A = not available

Source: Plastic tables, e.g. Plastic Compendium, Franck, Vogel-book publisher, manufacturers' data sheets

The information given in the tables is intended as a guide for the preselection of products and is based on our current knowledge.

The properties can be negatively influenced by the geometry of the products and the type of application.

More detailed information is available on request. To test the suitability of a product, a test under the specific environmental conditions is required.

Further chemical resistances can be found on our homepage at www.kleinhuis.de > Download > Catalogues

Bonding and Grounding

The National Electrical Code states that all metallic cable trays supporting electrical conductors shall be properly bonded (NEC 250.90 and NEC 250.96) and grounded (NEC 392.7).

- Definition: **Bonding** grants electrical continuity of separate sections (of cable tray).
- Definition: **Grounding** grants a low impedance (direct) connection to earth.
- Standards: According to NEC a properly bonded system can be used as an EGC (equipment grounding conductor) within the limits of NEC Table 392.7(B), i.e. the cable tray can replace the green (ground) wire. This standard is valid only in the US!

Maximum Fuse / Circuit Breaker Ampere Rating	60 A	100 A	200 A	400 A	600 A
Minimum Cross Sectional Area of Steel	0.20 sq in	0.40 sq in	0.70 sq in	1.00 sq in	1.5 sq in
	129 mm²	258 mm²	452 mm²	645 mm²	968 mm²

- Standards: In Canada (and almost the rest of the world) cable trays can't be used as a grounding conductor.
- This difference in electrical standards leads to two different UL classifications:

- The C-UL-US classified trays can be used as EGC in the US, the C-UL trays not. But both labels grant proper bonding according to NEC and CSA as long as UL rated splices are used.

WARNING!

Do Not Use As A Walkway, Ladder, Or Support For Personnel.

Use Only As A Mechanical Support For Cables, Tubing and Raceways.

Catalog Number:
(and description)

Minimum Area:
Load Class:

FB3M

This product is classified by Underwriters Laboratories, Inc. as to its suitability as an equipment grounding conductor only.

E233344

NIEDAX®

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METAL CABLE TRAY
IN ACCORDANCE WITH THE
STANDARD FOR METAL CABLE TRAY SYSTEMS
NEMA VE1
CAN/CSA-C22.2 NO. 126.1 **9JA9**

Bonding of Cable Tray

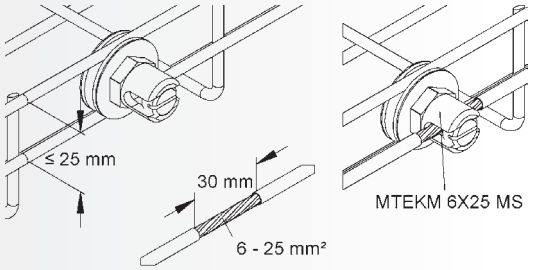
Per NEC 392, the National Electrical Code section for cable tray, all cable tray systems must be properly BONDED (section 250.96). To meet this requirement, Niedax recommends that UL classified splicing solutions are used to join sections and that the cable tray be bonded to building steel or the facility grounding system.

The integrated splices of Niedax MTC wire mesh tray and all standard splices (e.g. RVVX for cable trays, WSVX for long span ladders) are providing proper bonding between sections. These splices have been tested by UL as part of the cable tray grounding system.

Niedax steel support systems (e.g. the HU hanger series or C-rail trapeze kits) clamped securely to building steel usually provide a solid bond. If supports are installed to concrete or other nonconductive materials supplementary bonding jumpers from the tray to the building steel are required about every 20 meters.

Because all cable tray needs to be electrically continuous per NEC 250.96 painted/powder-coated tray requires the outer mask of the conductive surface to be removed at each end of the tray prior to installing any splices to ensure a UL Classified Bonding continuity between painted tray sections. The other way to guarantee proper bonding for painted/powder-coated tray would be to install a continuous equipment ground wire along the tray. For each section of tray at least one UL classified grounding lug has to be installed directly to the conductive surface and connected to the EGC.

Niedax does not offer any UL listed grounding lugs and wires.



Installation Instructions

INSTALLATION

Attention Cable Tray Installers – Cable tray system design shall comply with NEC Article 392, NEMA VE 1, IEC 61537 and shall follow safe work practices as described in NFPA 70E and NEMA VE 2.

The instructions and information contained here-in are not intended to cover all details or variations in cable tray systems, nor do they account for every possble installation scenario.

It is recommended that the installation work described be performed by qualified personnel, preferrably a certified electrical contractor, familiar with standard electrical construction practices, electrical equipment, and safety of electrical wiring systems.

TYPE OF CABLE

According to NEC Article 318, multiconductor tray cable may be installed in any standard cable tray bottom type. Single conductor tray cable may be installed only in ladder or ventilated bottom cable trays (not solid bottom). Solid bottom cable trays are not allowed to be installed in Class II, Division 2 locations (1999 NEC Section 502-4(b)). In general, small, highly flexible cables should be installed in solid bottom, vented bottom cable trays. Sensitive cables (e.g. fiberoptic) are typically installed in flat, solid bottom cable trays, instead of corrugated trough bottoms. Larger, less flexible cables are typically installed in ladder type cable trays having 12“ rung spacing.

SUPPORT INSTALLATION

Caution! Supports for cable trays should provide strength and working load capabilities sufficient to meet the load requirement of the cable tray wiring system. Consideration should be given to the loads associated with future cable additions or any other additional loads applied to the cable tray system or the cable trays support system.

There are many different ways of supporting cable trays. The most common approach in the US is to use threaded rod and a rail to build a trapeze hanger. Other systems like ceiling hangers with cantilever brackets will allow cables to be laid into the tray instead of being pulled through.

STRAIGHT SECTION POSITION

After the supports are in place, the installation of the cable tray can begin at any place that is convenient. It is not necessary to start at one end of the run. It is ideal to lay out the system so that splice joints fall between the support and the quarter point. This maximizes the rigidity of the cable tray.

To begin, place a straight section across two supports so that the ends of the section are not directly on the support. If the support span is equal to the length of the straight sections, bolt two pieces together for this step. As a general practice, avoid placing splice plates over supports or at mid-span.

FIELD MODIFICATIONS

Cable Tray can be adapted (cut to spec in field situations). These field modifications should be made by qualified personnel only (preferrably a certified electrical contractor).

BARRIER REQUIREMENTS

Barrier strips are used to separate cable systems, such as when cables above and below 600 volts per NEC 318-6(f) are installed in the same cable tray. However, when MC type cables rated for over 600 volts are installed in the same cable tray with cables rated 600 volts or less, no barriers are required. The barriers should be made of the same material type as the cable tray. When ordering the barrier, the height must match the loading depth of the cable tray into which it is being installed.

FUTURE EXPANSION REQUIREMENTS

One of the many features of cable tray is the ease of adding cables to an existing system. Future expansion should always be considered when selecting a cable tray, and allowance should be made for additional fill area and load capacity. A minimum of 50% expansion allowance is recommended.

SPACE LIMITATIONS

Any obstacles which could interfere with a cable tray installation should be considered when selecting a cable tray width and height. Adequate clearances should be allowed for installation of supports and for cable accessibility. Note: the overall cable tray dimensions typically exceed the nominal tray width and loading depth.

Fitting Radius

CABLE FLEXIBILITY

The proper bend radius for cable tray fittings is usually determined by the bend radius and stiffness of the tray cables to be installed. Typically, the tray cable manufacturer will recommend a minimum bend allowance for each cable. The fitting radius should be equal to or larger than the minimum bend radius of the largest cable which may ever be installed. When several cables are to be placed in the same cable tray, a larger bend radius may be desirable to ease cable installation.

Space Limitations

The overall dimensions for a cable tray fitting will increase as the bend radius increases. Size and cost make the smallest acceptable fitting radius most desirable. When large radius fittings are required, the system layout must be designed to allow for adequate space.

Fittings Installation

RECOMMENDED SUPPORT LOCATIONS FOR FITTINGS

The following are recommended support diagrams to serve as guidelines for installing Steel Cable Tray support systems in the field. The information is intended to provide the installer some practical assistance when estimating the amounts of necessary supports and to help in identifying support locations for various field conditions.

However, it does not cover every situation that may arise when installing the product. It may be possible to install narrow trays with lighter loads and fewer supports. Wider trays with heavier loading, trays with long radii, or those with multiple side cuts may require additional support to avoid unwanted deflection.

HORIZONTAL ELBOW SUPPORT

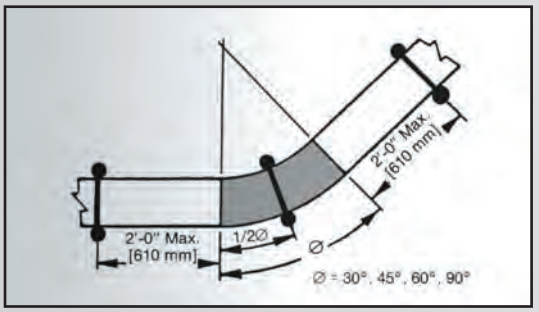
Supports for horizontal cable tray fittings should be placed within 2ft. (600 mm) of each fitting extremity, and as follows:

a. 90° supports at the 45° point of arc.

b. 60° supports at the 30° point of arc.

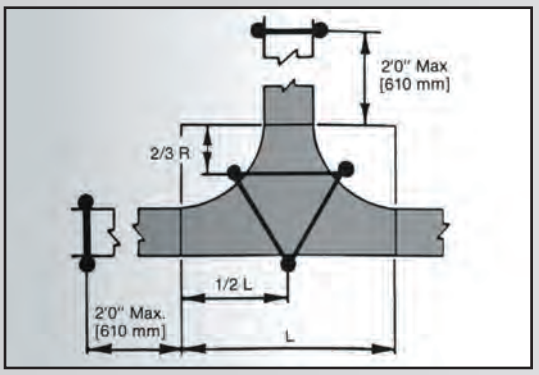
c. 45° supports at the 22-1/2° point of arc (except for the 12 in. [300 mm] radii).

d. 30° supports at the 15° point of arc (except for the 12 in. [300 mm] radii).



HORIZONTAL TEE SUPPORT

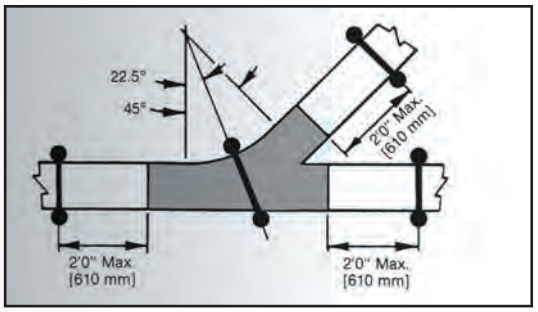
Place horizontal tee supports within 2 ft. (600 mm) of each of the three openings connected to other cable tray items for the 12 in. (300 mm) radius. On all other radii, at least one additional support should be placed under each side rail at the horizontal tee, preferably as shown.



Other Factors To Consider

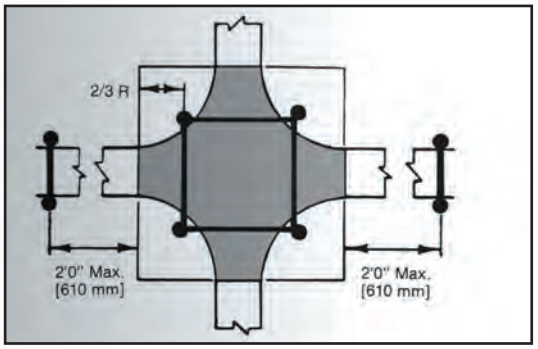
HORIZONTAL Y SUPPORT

Place horizontal Y supports within 2 ft. (600 mm) of each of the three openings connected to other cable tray items, and at 22-1/2° point of the arc adjacent to the side branch.



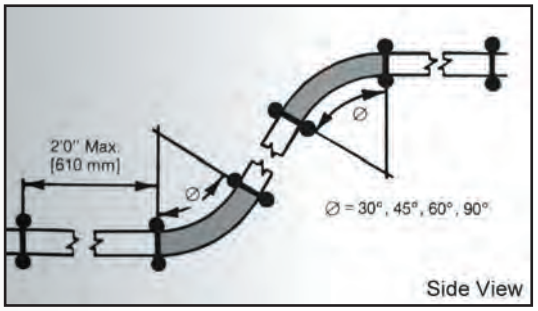
HORIZONTAL CROSS SUPPORT

Place horizontal cross support within 2 ft. (600 mm) of each of the four openings connected to other cable tray items for the 12 in. (300 mm) radius. On all other radii, at least one additional support should be placed under each side rail of the horizontal cross, preferably as shown.



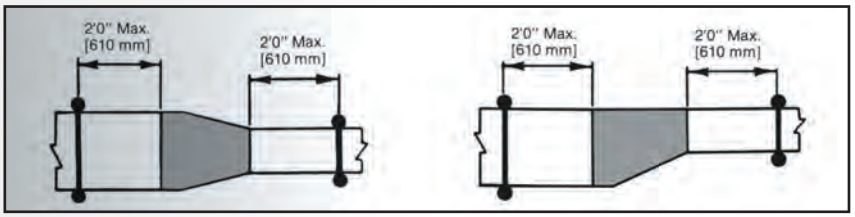
VERTICAL CABLE TRAY ELBOW

Vertical cable tray elbows at the top of runs should be supported at each end. At the bottom of runs, they should be supported at the top of the elbow and within 2 ft. (600 mm) of the lower extremity of the elbows.



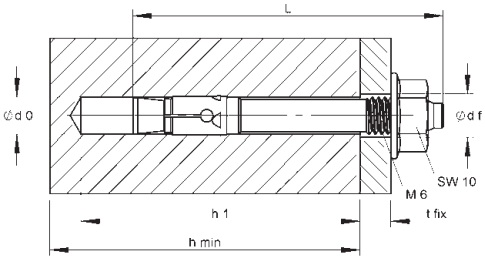
REDUCER SUPPORT

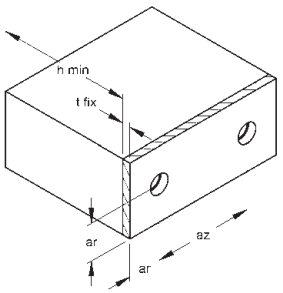
Place reducer supports within 2 ft. (600 mm) of each fitting extremity.



Technical Information

Expansion Anchor DAM





DAM 6X5
DAM 6X10

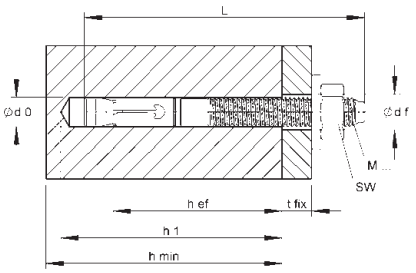
Permissible loads for centric pull, shear pull and diagonal pull at any angle and anchor characteristics and component dimensions for concrete strength class ≥ B 25 or C 20/25 and ≤ B 55 or C 50/60.
The entire approval notice ETA-18/0541 shall be observed for the design.
gvz = galvanized according to DIN EN ISO 2081/DIN EN ISO 4042, blue passivated.

Type of anchor		**DAM 6X5[1] gvz**	**DAM 6X10[1] gvz**
Permissible load of individual anchors	kN	2,4	2,4
Permissible bending moment M (without tensile load)	Nm	5,2	5,2
Max. Torque when mounting the attachment part with a torque wrench	Nm	4	4
Nominal drilling diameter d_0 =	mm	6	6
Blade diameter ≤	mm	6,4	6,4
Through hole in the component to be connected d_f ≤	mm	7,0	7,0
Minimum hole depth (t) h_1 ≥	mm	36	36
Minimum anchoring depth h_v ≥	mm	30	30
Centre distance between the outer dowels of adjacent dowel groups or single dowels az ≥	mm	200[2]	200[2]
Distance of the outer dowels to the edge of the component ar ≥	mm	100[3]	100[3]
Minimum thickness h min ≥	mm	80	80
Total length L =	mm	50	55
Thickness of the attachment t_{fix} ≤	mm	5	10

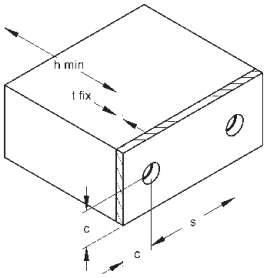
1) The partial safety factors of the resistors regulated in the approval and a partial safety factor of the action γF = 1.4 are taken into account.
2) The centre distance can be reduced to 100 mm while simultaneously reducing the permissible load.
3) The edge distance can be reduced to 50 mm while reducing the permissible load.
For outdoor use we recommend dowels made of stainless steel.

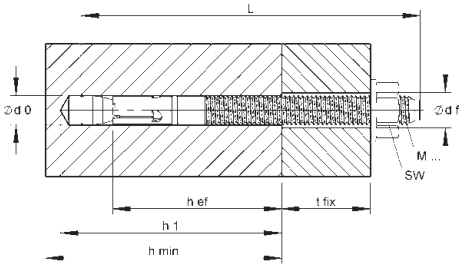
Technical Information

Expansion Anchor DAZ



DAZ 8X10
DAZ 10X10
DAZ 12X10





DAZ 10X30
DAZ 16X25

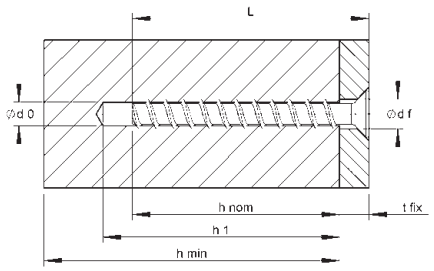
Maximum permissible loads[1] of an anchor in normal concrete C20/25[2]. The entire approval notice ETA-18/0542 shall be observed for the design.
gvz = galvanized to DIN EN ISO 2081/DIN EN ISO 4042, blue passivated.

Type of anchor		**DAZ 8X10** gvz	**DAZ 10X10 DAZ 10X30** gvz	**DAZ 12X10** gvz	**DAZ 16X25** gvz
Effective anchorage depth h_{ef}	mm	45	60	70	85
Permissible centric tensile load of a single anchor without boundary influence N_{zul}[3]					
Cracked concrete C20/25[2]	kN	3,8	6,2	9,5	13,4
Non-cracked concrete C20/25[2]	kN	6,7	9,5	10,5	18,8
Permissible shear force of a single anchor without boundary influence V_{zul}[3]					
Gerissener und ungerissener Beton C20/25[2]	kN	7,8	12,2	17,5	31,4
Permissible bending moment (M_d) M_{zul}	Nm	14,8	29,7	52,6	133,1
Component dimensions and assembly parameters[4]					
Standard component thickness (≥ 2 x h_{ef}) $h_{min, 1}$ =	mm	100	120	140	170
Minimum centre distance s_{min} =	mm	35 (40)	40	50	65
for c ≥	mm	50	55 (60)	70	95
Minimum edge distance c_{min} =	mm	40	45	55	65
for s ≥	mm	70 (100)	80	110	150
Reduced component thickness (< 2 x h_{ef}) $h_{min, 2}$ =	mm	80	100	120	140
Minimum centre distance s_{min} =	mm	35	40	50	80
for c ≥	mm	70	100	90	130
Minimum edge distance c_{min} =	mm	40	60	60	65
for s ≥	mm	100	90	120	180
Nominal drilling diameter d_0 =	mm	8	10	12	16
Borehole depth (t) h_1 ≥	mm	55	75	90	110
Through hole in the component to be connected df ≤	mm	9	12	14	18
Torque during anchoring	Nm	20	45	60	110
Total length L =	mm	75	95 / 115	110	148
Minimum component thickness t_{fix} =	mm	10	10 / 30	10	25
Minimum thickness of the concrete component h_{min} =	mm	80	80	100	140

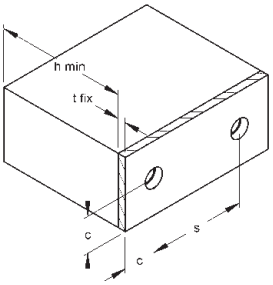
1) The partial safety factors of the resistors regulated in the approval and a partial safety factor of yF = 1.4 are taken into account.
For the combination of tensile and transverse loads, for boundary influences and for anchor groups, please refer to design procedure A (ETAG Annex C).
2) The concrete is assumed to be normally reinforced or unreinforced; for higher concrete strengths up to 55 % higher values are possible.
3) I.e. for tensile load: edge distance c > 1.5 h_{ef} and centre distance s > 3 h_{ef} or for shear force: c > 10 h_{ef} and centre distance s > 3 h_{ef}.
4) The values in brackets only apply to non-cracked concrete.
For outdoor use we recommend dowels made of stainless steel.

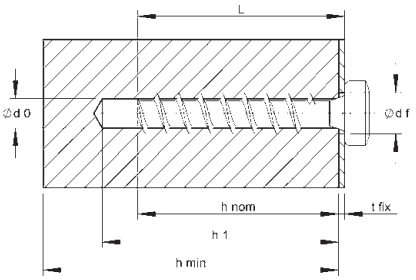
Technical Information

Concrete Screw Anchor NSA

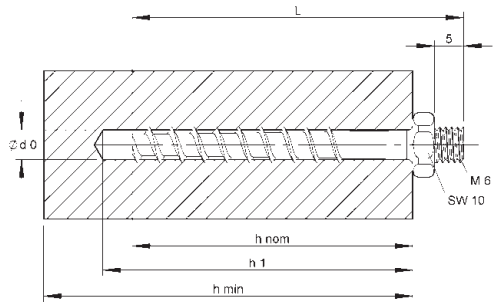


NSA 5X40/SK-T20 V

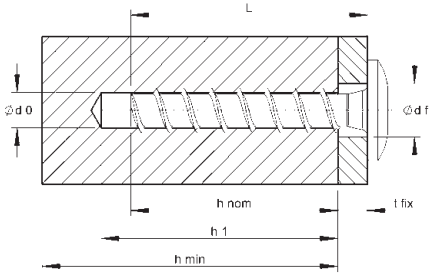




NSA 6X35/FKK-T30 V and NSA 6X50/FKK-T30 V



NSA 6X55/SW10-M6 V



NSA 7.5X40/FKG-T30 V and NSA 7.5X50/FKG-T30 V

Maximum permissible loads[1] of a single anchor for fixings in standard concrete C 20/25[2].
The entire approval notice ETA - 15/0784 must be observed for the design. gvz = galvanized according to DIN EN ISO 2081/DIN EN ISO 4042, blue passivated

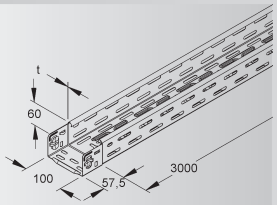
Type of anchor		NSA 5X40/ SK-T20 V gvz	NSA 6X35/ FKK-T30 V gvz	NSA 6X50/ FKK-T30 V gvz	NSA 6X55/ SW10-M6 V gvz	NSA 7.5X40/ FKG-T30 V gvz	NSA 7.5X50/ FKG-T30 V gvz
Screw-in depth h_{nom} ≥	[mm]	35	35	45/35	45	35	35
Permissible centric tensile load of a single anchor without boundary influence N_{zul}[3]							
Cracked concrete C20/25[2]	[kN]	1,8	0,5	0,7/0,5	0,7	1,0	1,0
Non-cracked concrete C20/25[2]	[kN]	2,6	2,0	3,0/2,0	3,0	2,0	2,0
Permissible shear force of a single anchor without boundary influence V_{zul}[3]							
Cracked concrete C20/25[2]	[kN]	2,0	2,3	2,4[6]	2,4[6]	2,4	2,4
Non-cracked concrete C20/25[2]	[kN]	2,0	2,4[6]	2,4[6]	2,4[6]	3,4	3,4
Permissible bending moment (M_d) M_{zul}	[Nm]	-	4,0	4,0	4,0	8,4	8,4
Component dimensions and assembly parameters[4]							
Standard component thickness (≥ 2 x h_{ef}) $h_{min, 1}$ =	[mm]						
Minimum centre distance s_{min} =	[mm]	35	30	30	30	40	40
for c ≥	[mm]						
Minimum edge distance c_{min} =	[mm]	35	30	30	30	40	40
for s ≥	[mm]						
Nominal drilling diameter d_0 =	[mm]	4	5	5	5	6	6
Borehole depth (t) h_1 ≥	[mm]	40	40	50	50	40	40
Length L =	[mm]	40	35	50	55	40	50
Calculated anchorage depth h_{ef} =	[mm]	25	26	35	35	26	26
Through hole in the component to be connected df ≤	[mm]	6	7	7	7	9	9
Recommended max. power output Setting tool Tinst[5] =	[Nm]	-	75	100	100	100	100
Recommended max. tightening torque Tinst =	[Nm]	8	-	-	-	-	-
Max. Thickness t_{fix} =	[mm]	5	1	5/15	-	5	15
Minimum thickness of the concrete component h_{min} =	[mm]	80	100	100	100	100	100

1) On the resistance side, the partial safety factors of the anchor resistances and the material partial safety factors of design methods A in accordance with Annex C of ETAG 001 or CEN/TS 1992-4 are taken into account. On the action side, a partial safety factor of YG = 1.35 was taken into account. For combined loads, anchor groups and axial or boundary influences, please observe the specifications for design methods A according to ETAG 001 Annex C or CENT/TS 1992-4 or our design aid.
2) The concrete is assumed to be normally reinforced or unreinforced; for higher concrete strengths, higher resistances may be possible.
3) I.e. for tensile load: edge distance c ≥ 1.5 * h_{ef} and centre distance s ≥ 3 * h_{ef} or for transverse force: c ≥ 10 * h_{ef} and centre distance s ≥ 3 * h_{ef}.
4) The values in brackets only apply to non-cracked concrete.
5) The tightening torque is specified in the approval notice, compliance with this specification is therefore relevant to the approval.
6) Steel failure decisive.

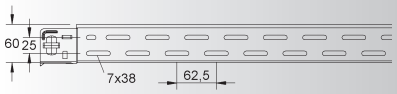
Hole Patterns

RLVC 60...

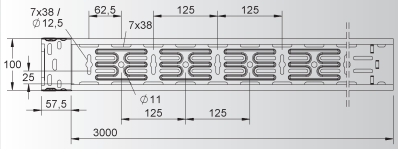
100 mm



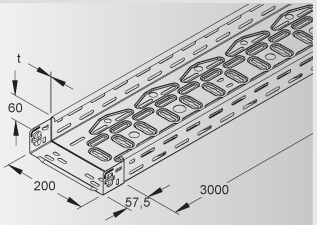
Siderail Pattern



Bottom Pattern



200 mm



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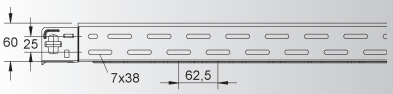
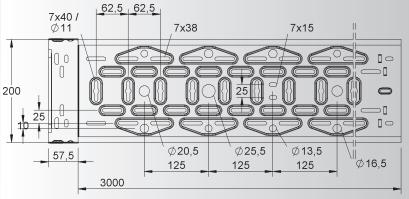
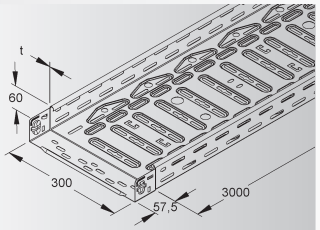


Bottom Pattern



300 mm



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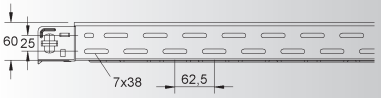
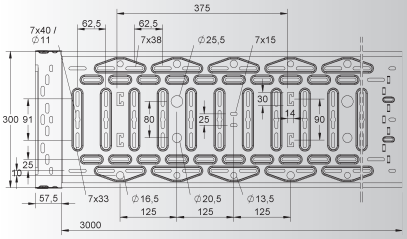
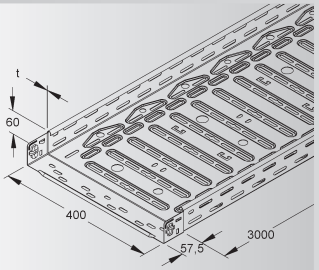


Bottom Pattern



400 mm



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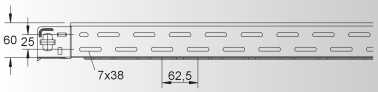
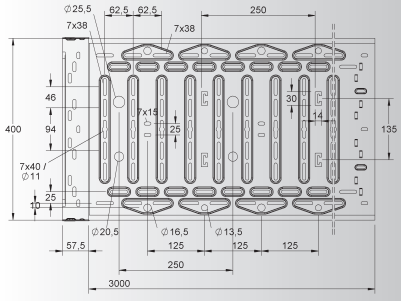
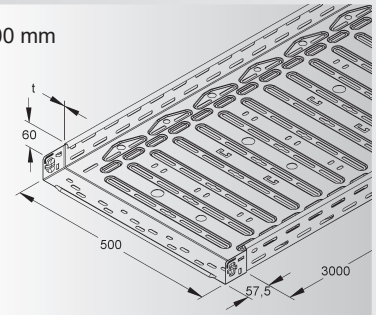


Bottom Pattern



500 mm



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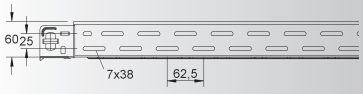
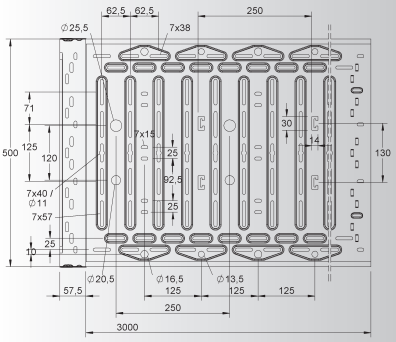
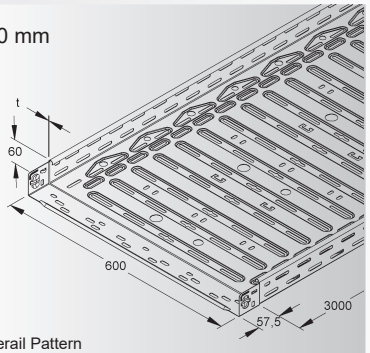


Bottom Pattern



600 mm



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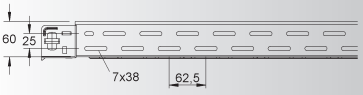
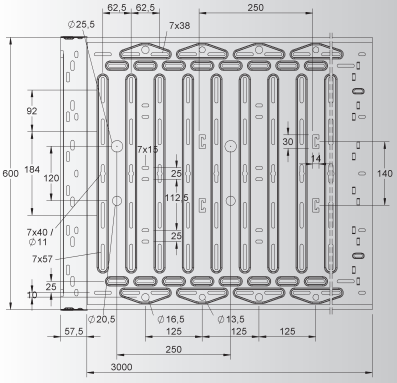


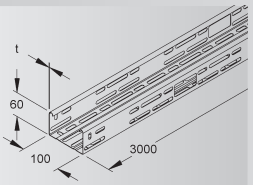
Bottom Pattern



Hole Patterns

RLCI 60...

100 mm



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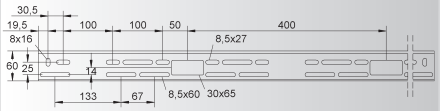
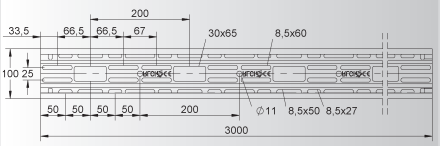
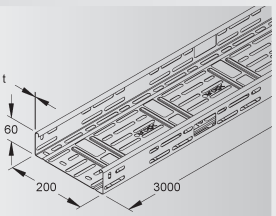


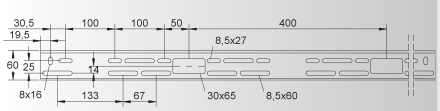
Bottom Pattern



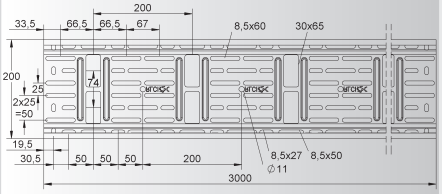
200 mm



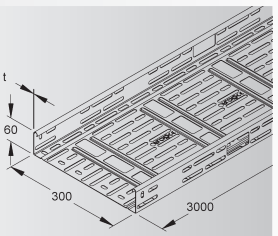
Siderail Pattern



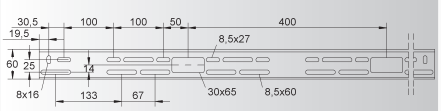
Bottom Pattern



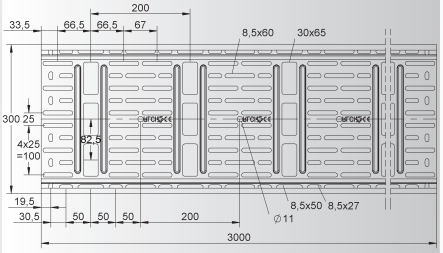
300 mm



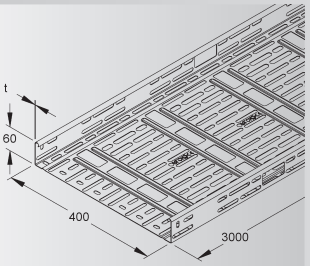
Siderail Pattern



Bottom Pattern



400 mm



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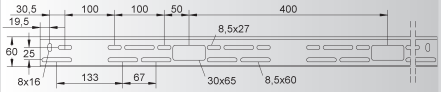
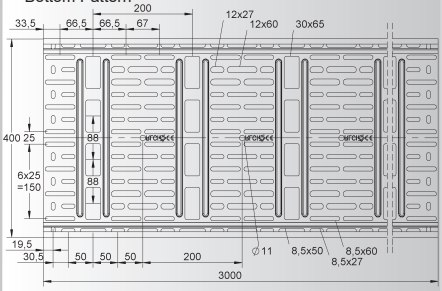
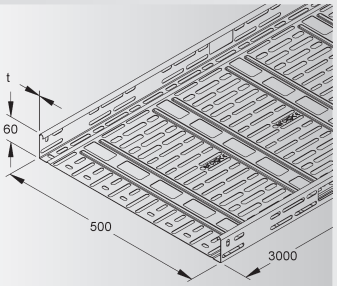


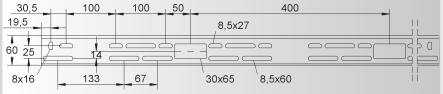
Bottom Pattern



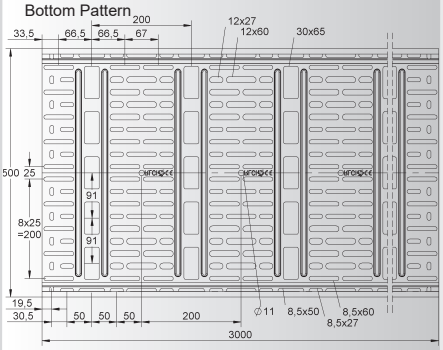
500 mm



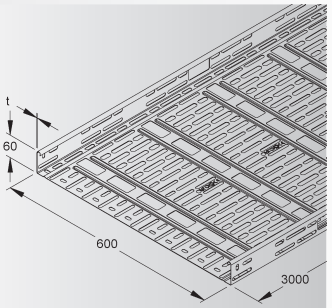
Siderail Pattern



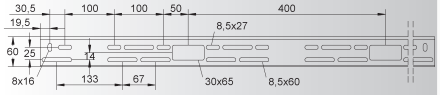
Bottom Pattern



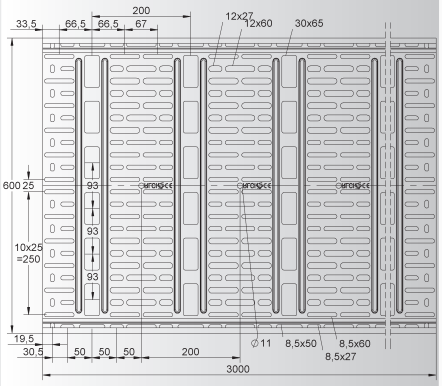
600 mm



Siderail Pattern



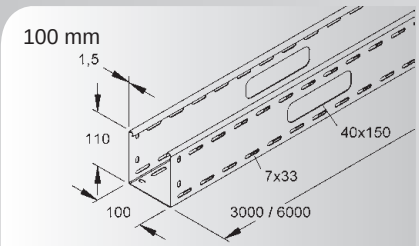
Bottom Pattern



Hole Patterns

RSV 110...

100 mm



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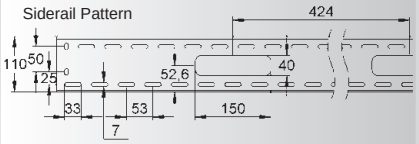
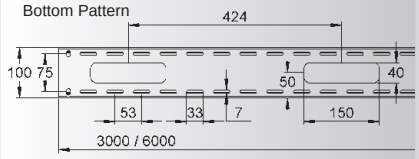
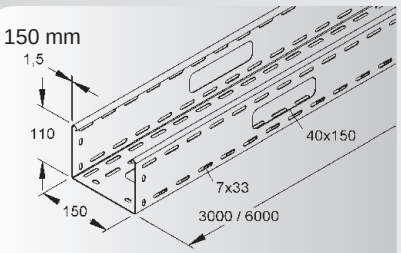


Bottom Pattern



150 mm



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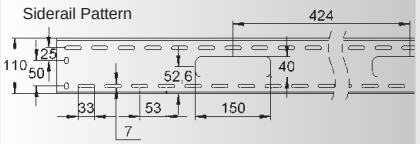
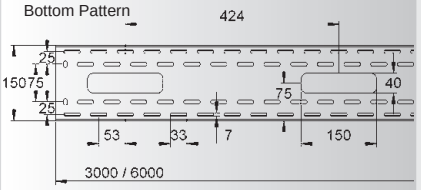
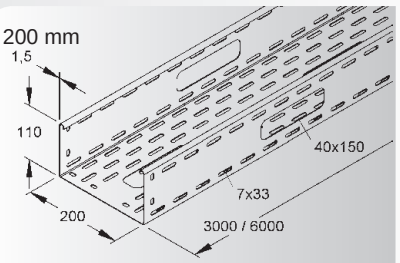


Bottom Pattern



200 mm



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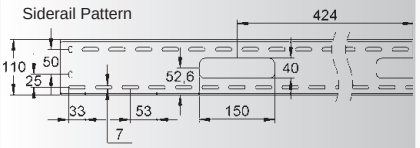
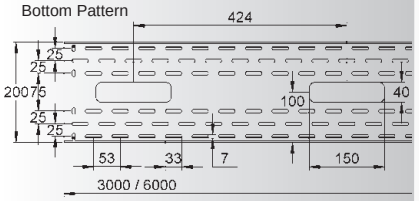
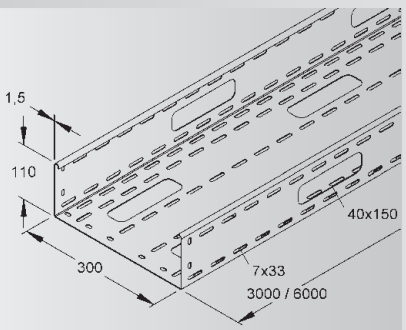


Bottom Pattern



300 mm



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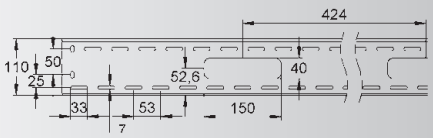
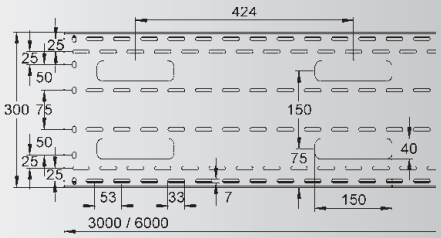
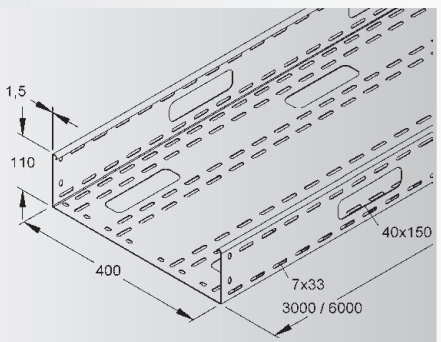


Bottom Pattern



400 mm



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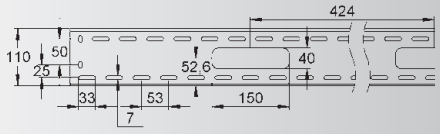
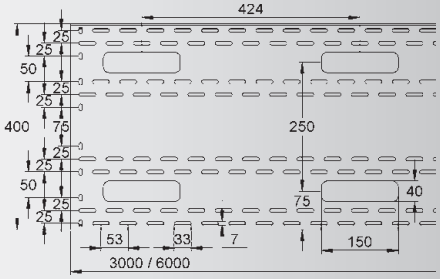


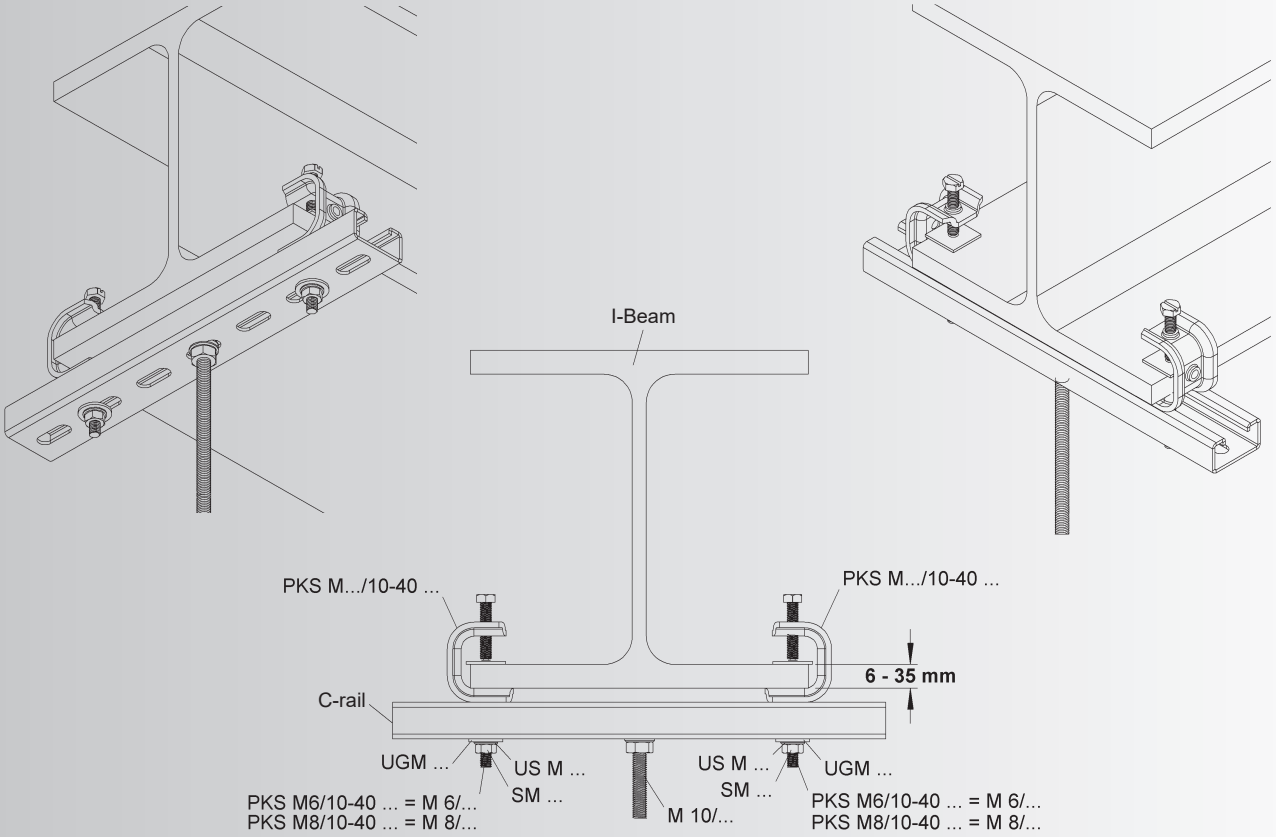
Bottom Pattern



Installation Instructions

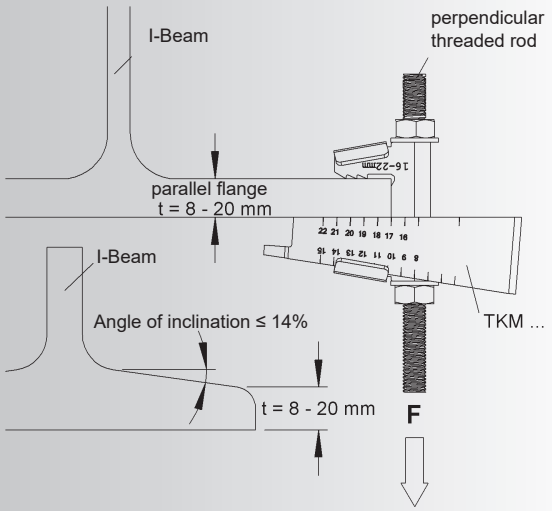
PKS...

Various applications possible.

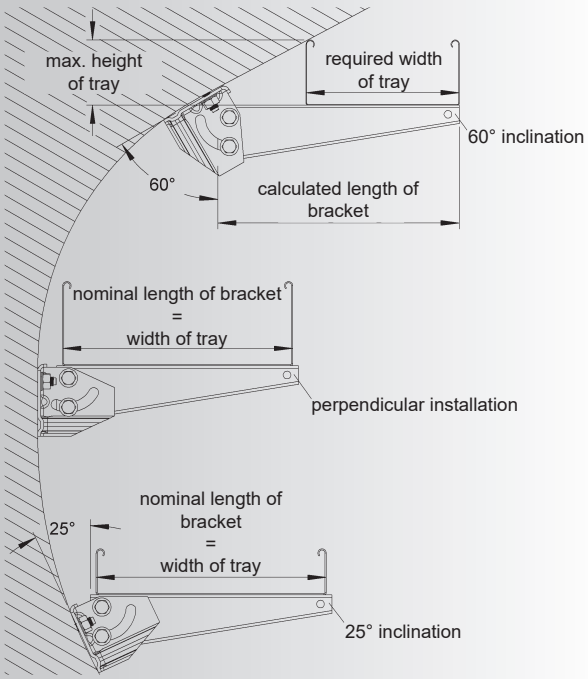


TKM...

The threaded rod can be preinstalled before attaching the clamp to the flange of the I-beam. For perpendicular loads only.

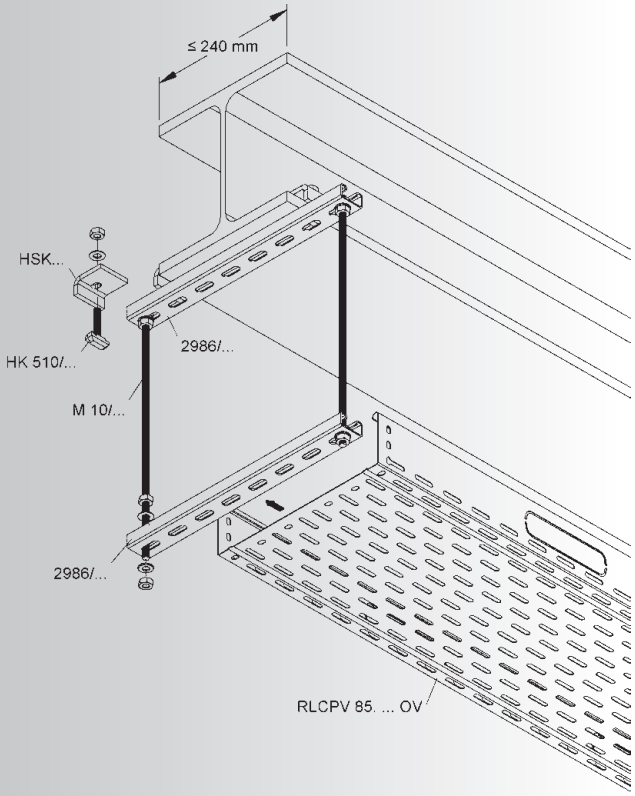


KTVW... F

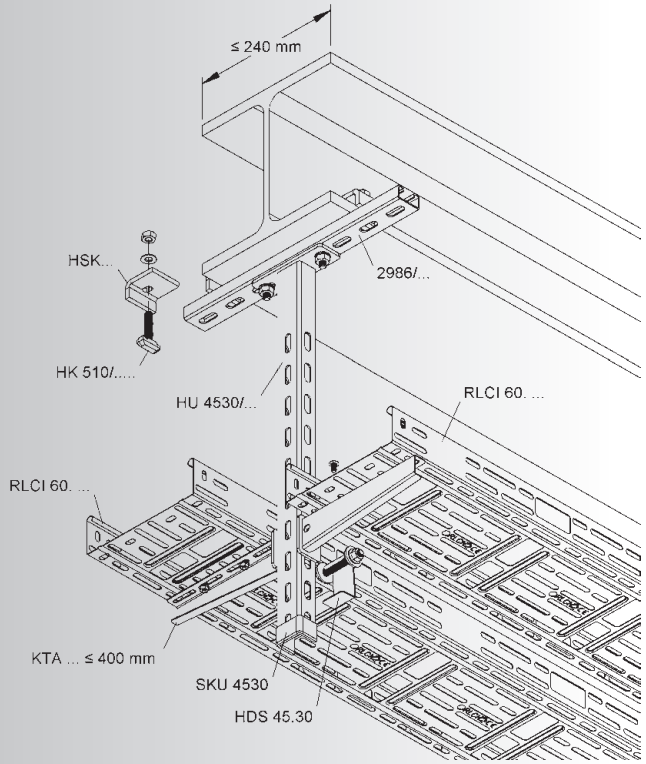


Installation Instructions

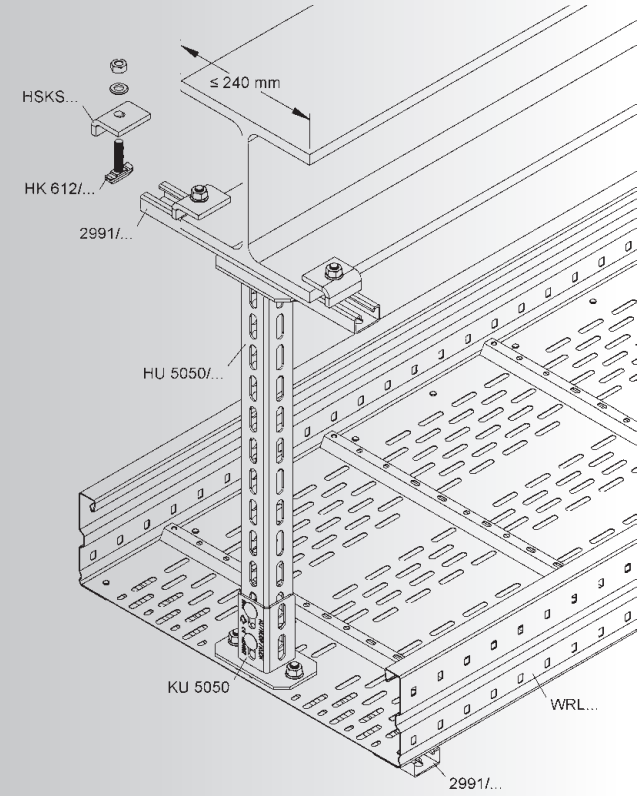
Typical clamping installation of cable tray to steel beams.



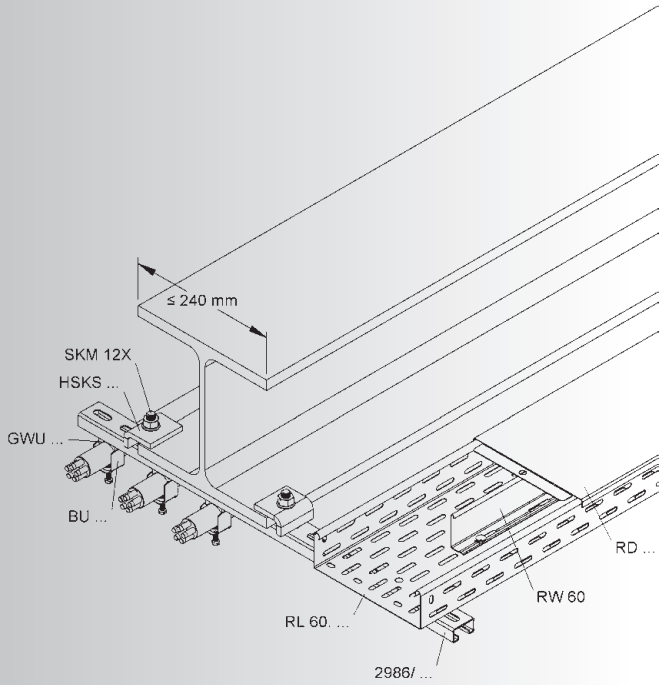
Typical clamping installation of cable tray to steel beams.



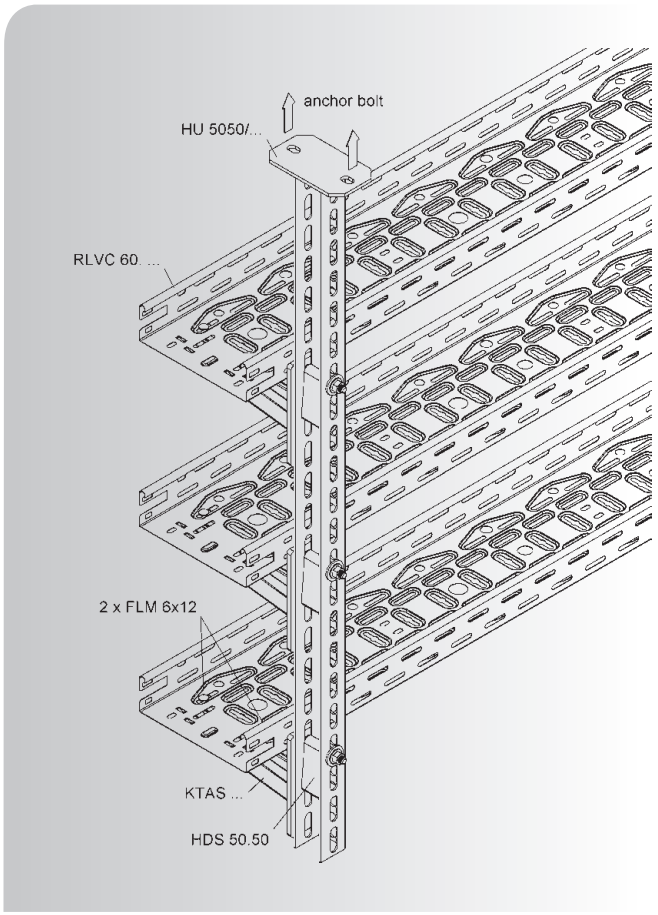
Typical clamping installation of longspan tray parallel to steel beams.

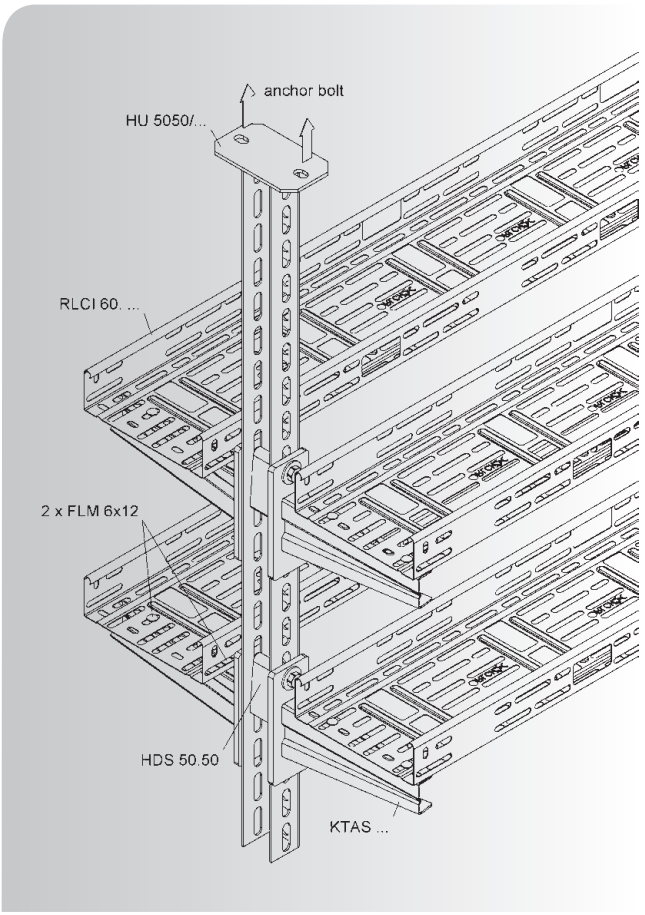


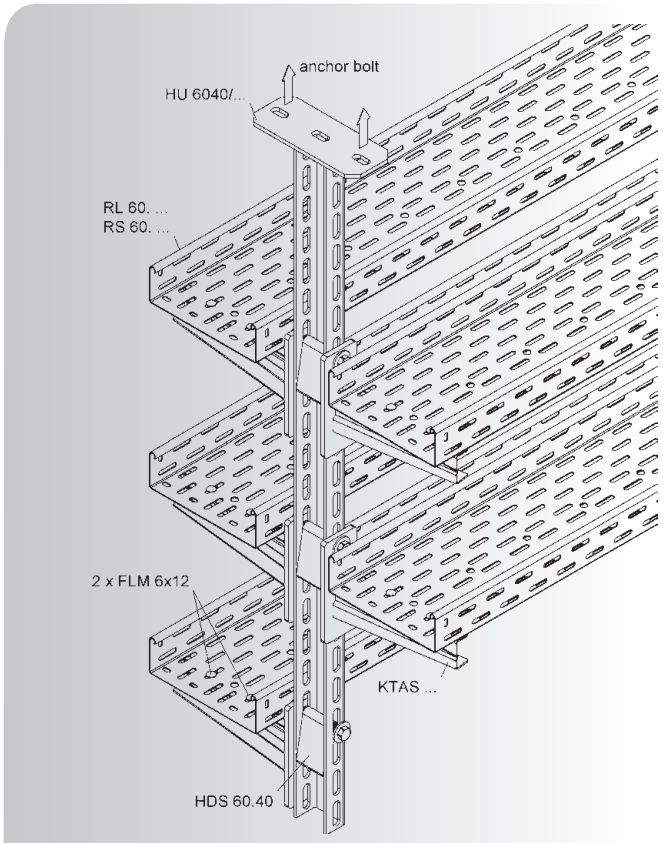
Typical clamping installation of cable tray parallel to steel beams.

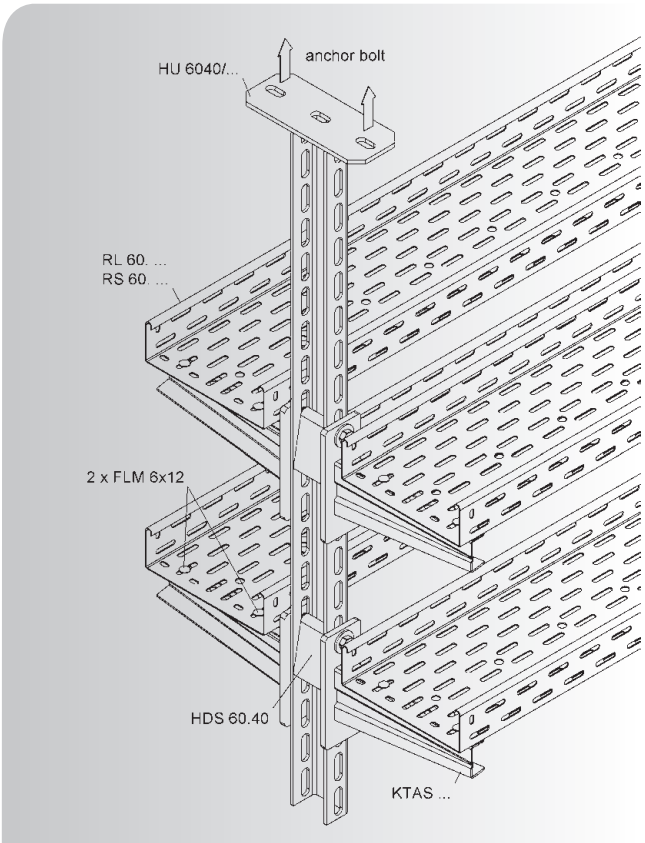


Installation Instructions



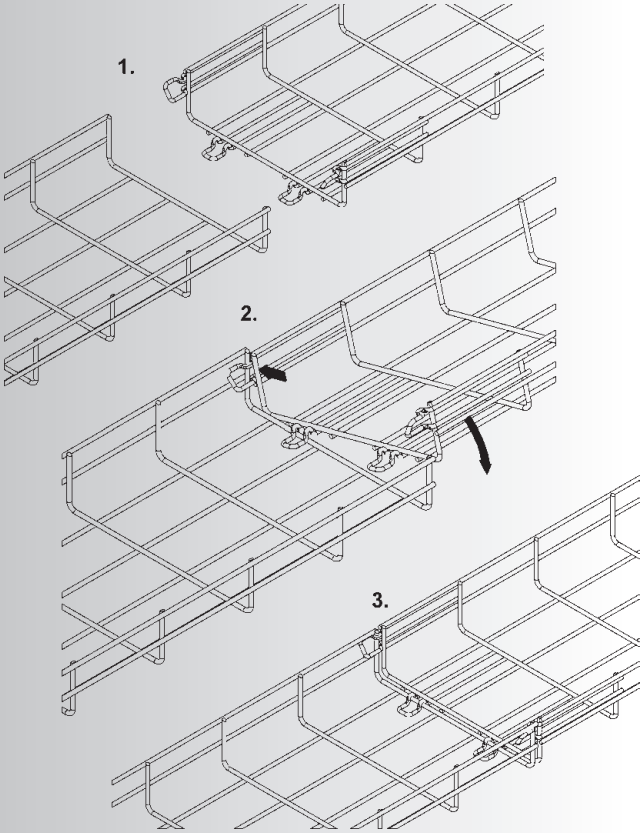




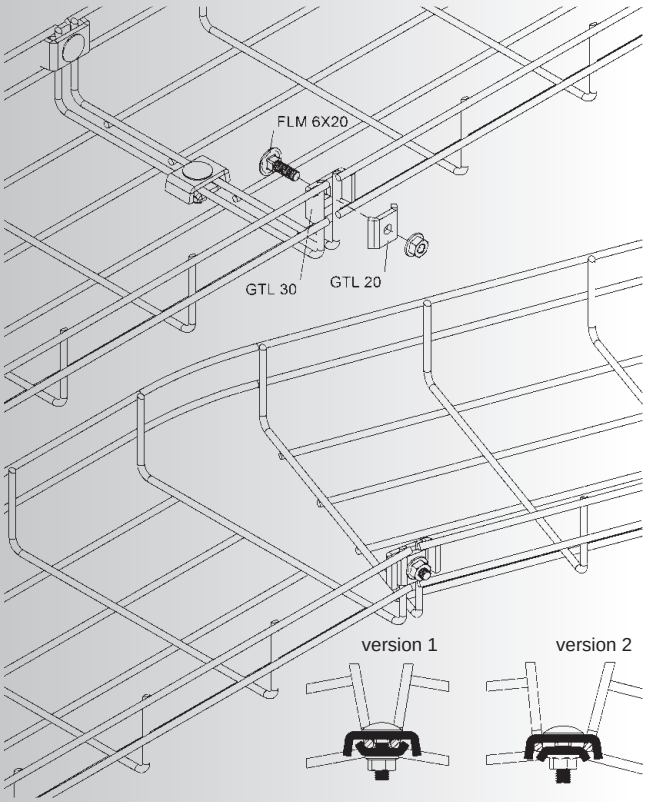


Installation Instructions

MTC... Wire Mesh Tray with Snap Connector



Splice Kit for and MTC... Wire Mesh Tray



flexible vertical outside elbow

number of segments per fitting:
MTCE 54.100 - 3 segments
MTCE 54.150 - 3 segments
MTCE 54.200 - 4 segments
MTCE 54.300 - 4 segments
MTCE 105.100 - 3 segments
MTCE 105.150 - 3 segments
MTCE 105.200 - 4 segments
MTCE 105.300 - 4 segments

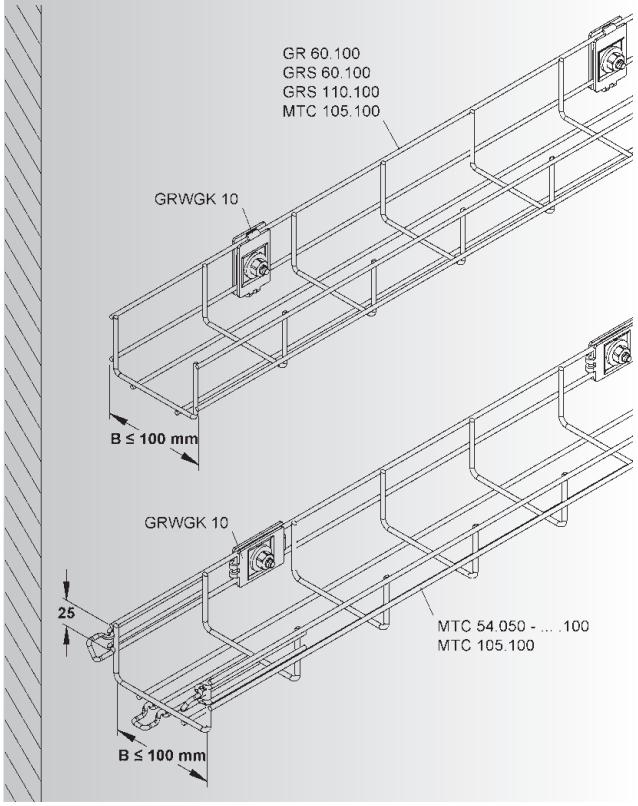
flexible vertical inside elbow

segments

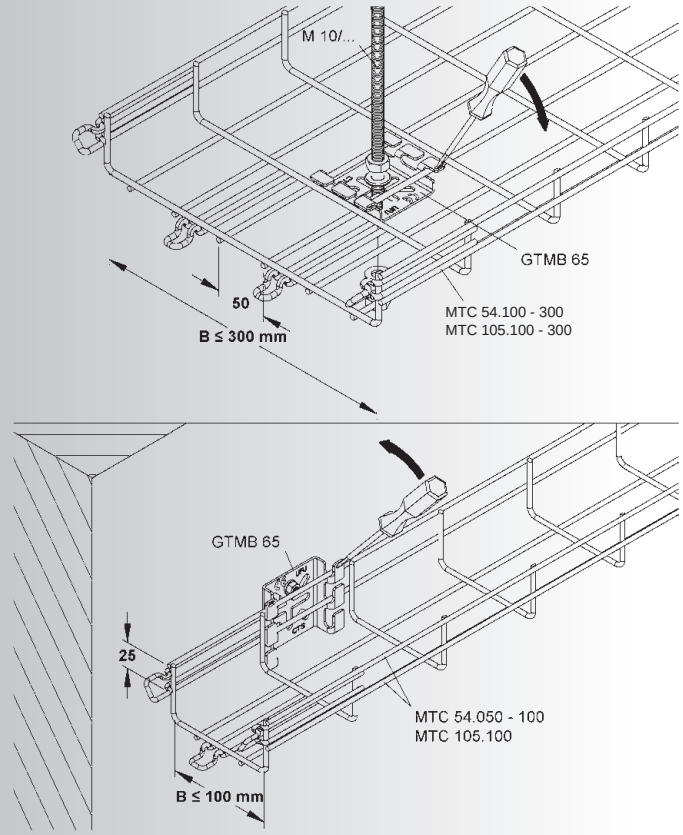
flexible horizontal elbow

Installation Instructions

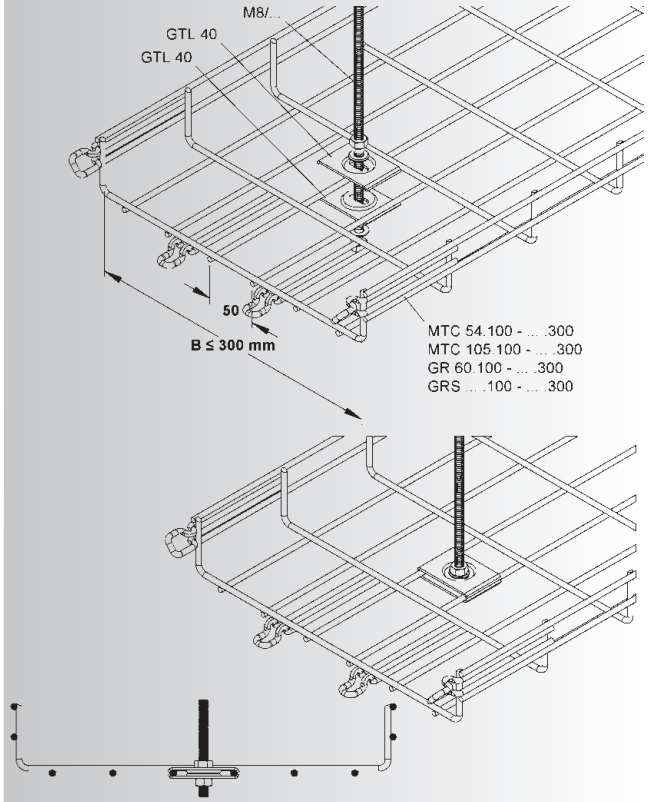
Wall Mount Bracket for GR..., GRS... and MTC... Wire Mesh Tray



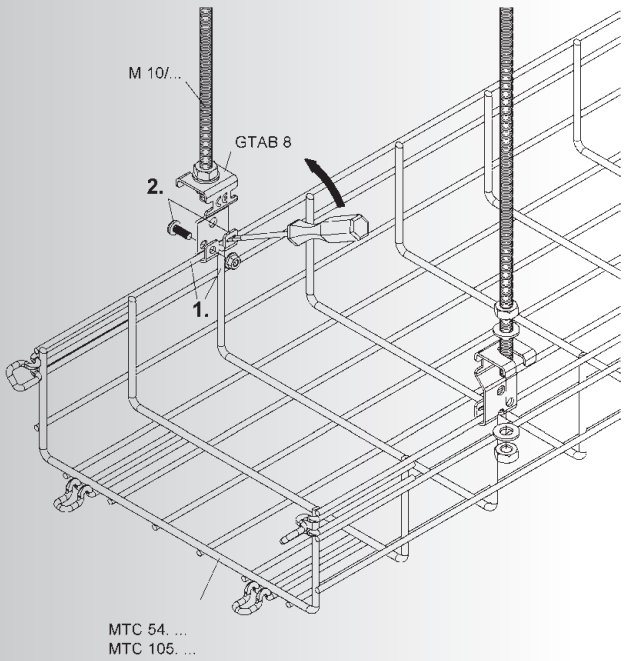
Center Hanger for MTC... Wire Mesh Tray



Center Hanger for GR..., GRS... and MTC... Wire Mesh Tray

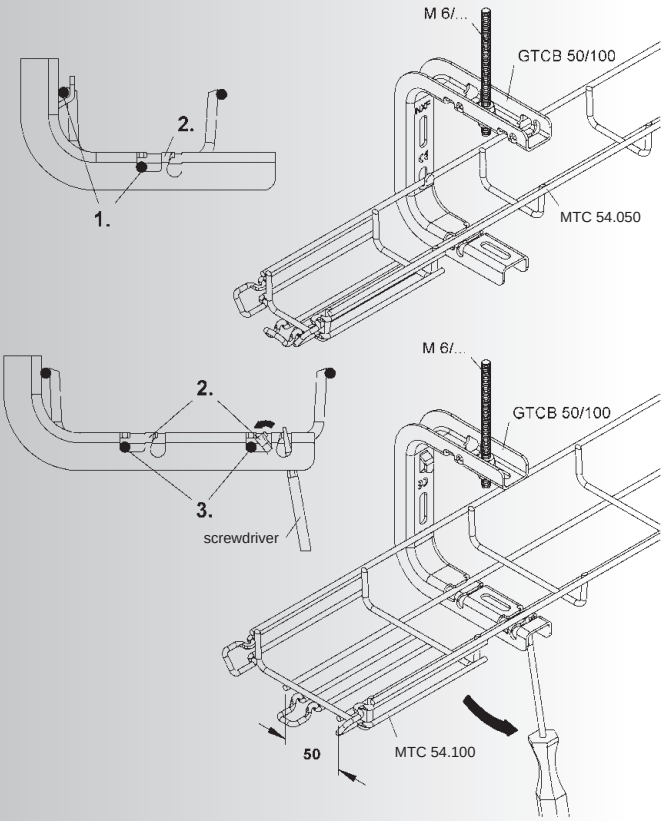


Trapeze Hanger for MTC... Wire Mesh Tray

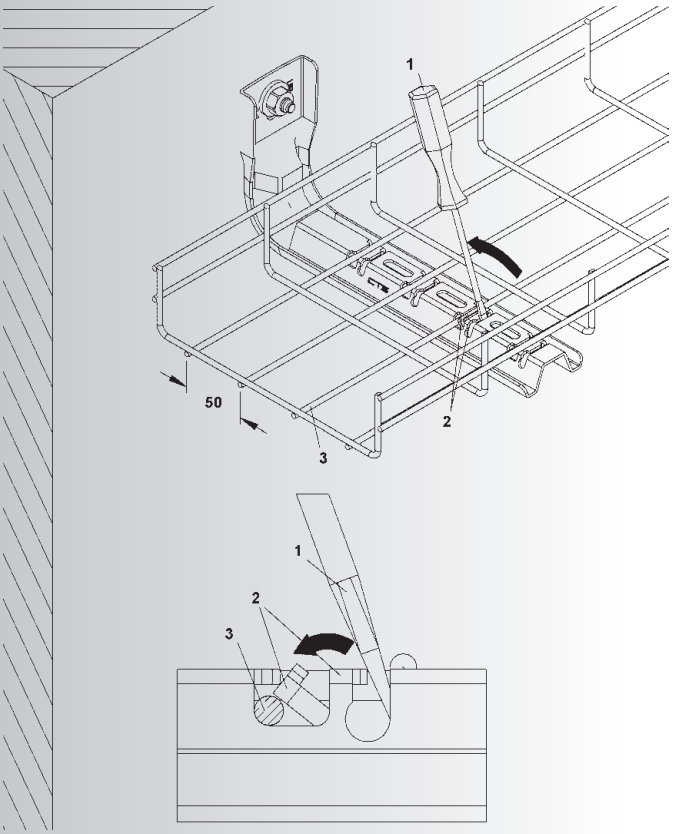


Installation Instructions

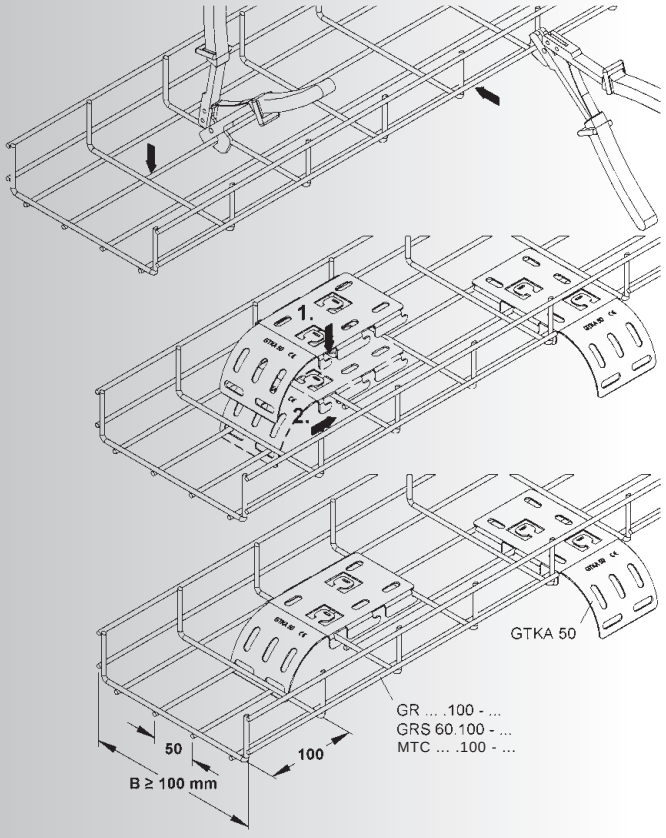
C-Hanger MTC... Wire Mesh Tray



L-Bracket for GRS... and MTC... Wire Mesh Tray



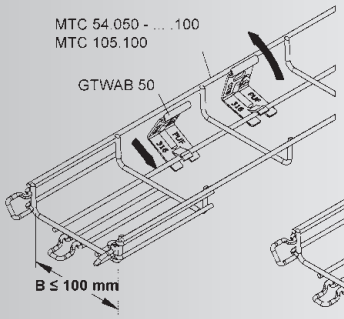
Cable Drop Outs for GR..., GRS... and MTC... Wire Mesh Tray



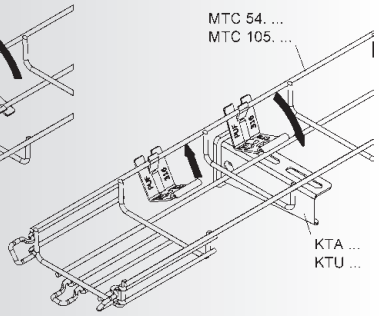
Wire Mesh Mounting Bracket GTWAB 50

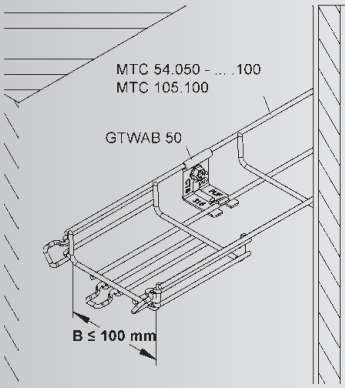
1. for direct wall mounting of MTC basket trays in 50 and 100 mm width
2. for bolting MTC basket tray to a wall bracket

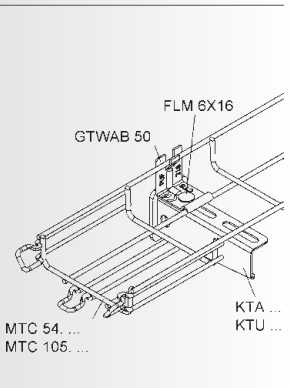
direct wall mounting



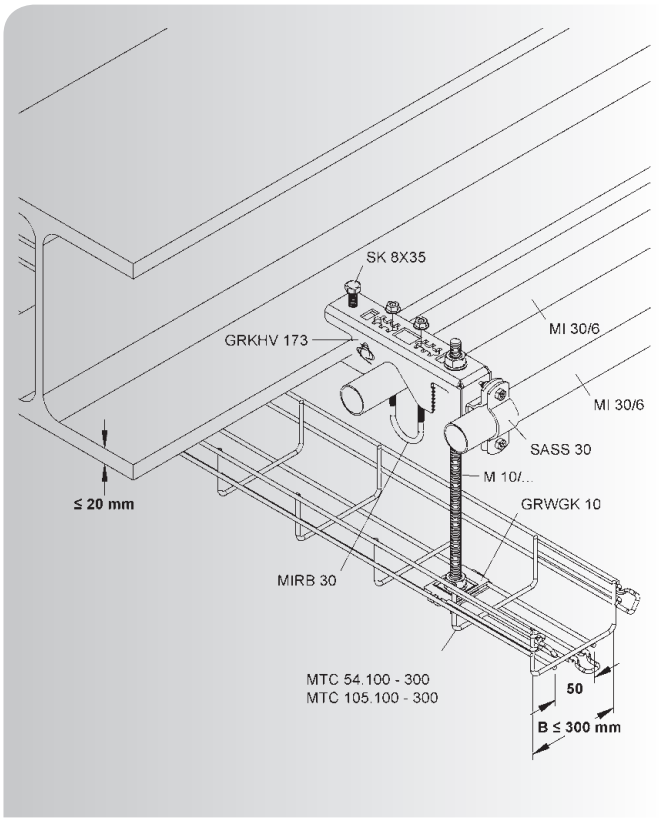
mounting to a bracket

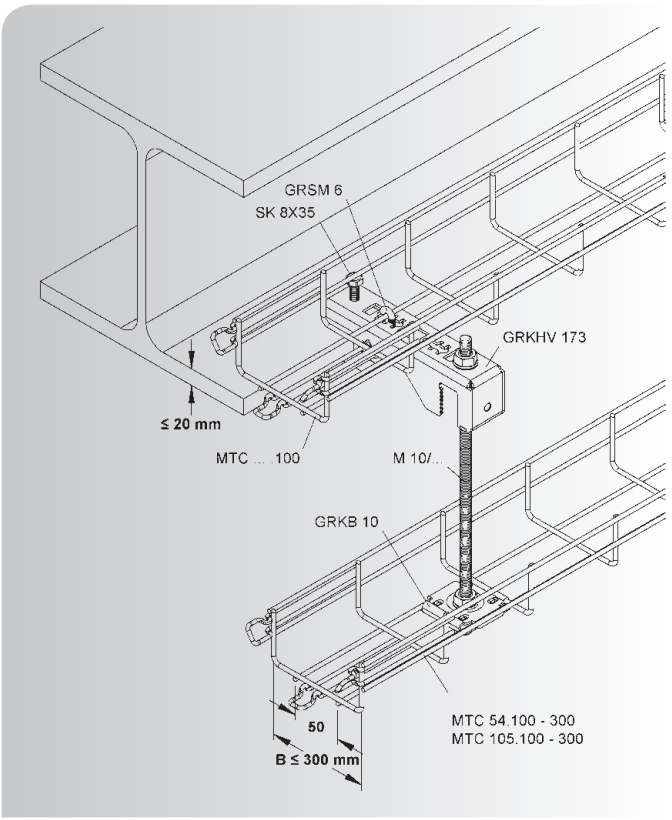


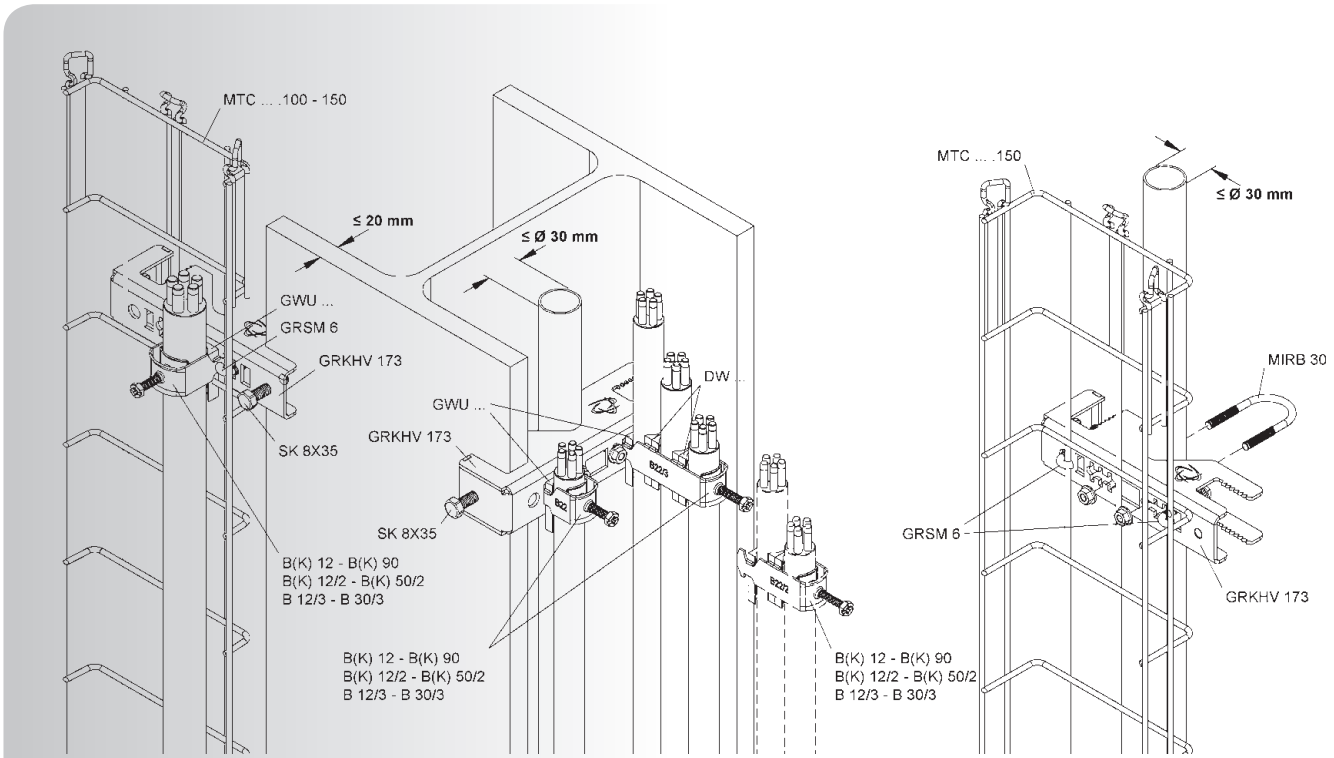




Installation Instructions







Installation Instructions

GRVS...

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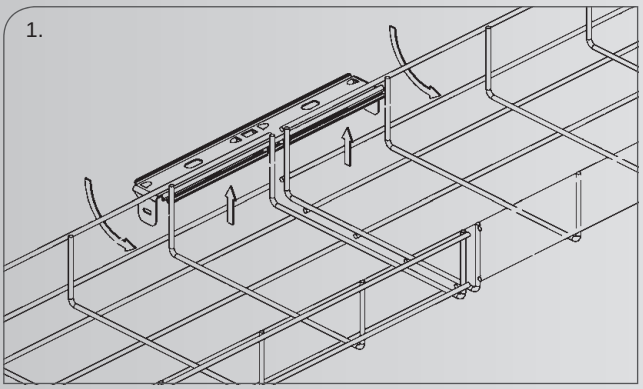

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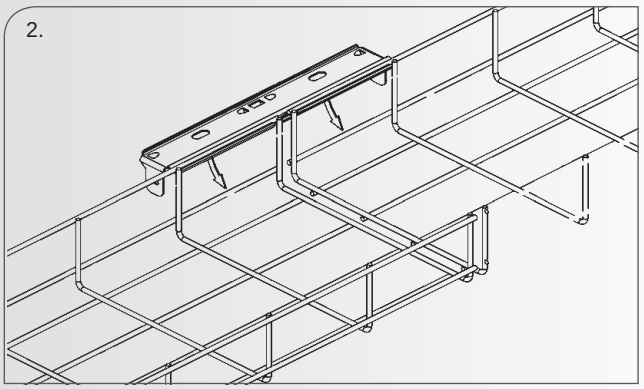

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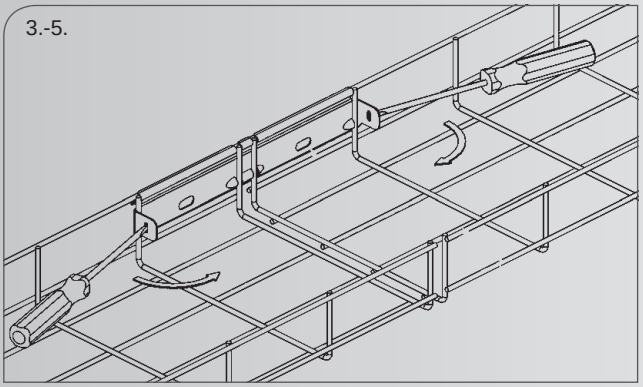

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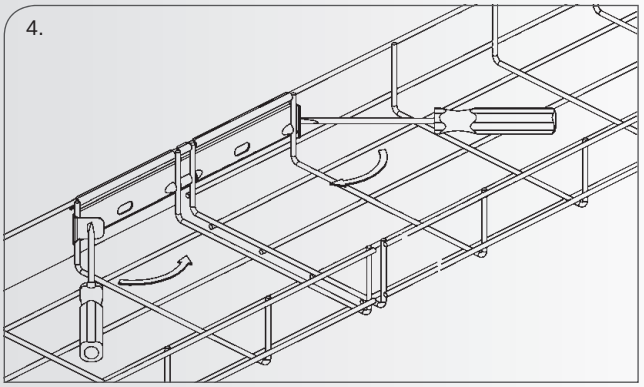

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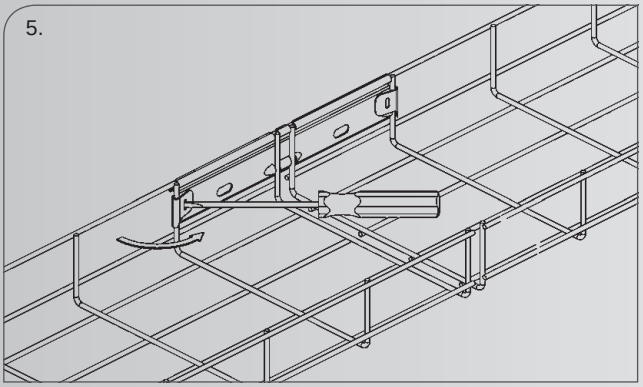

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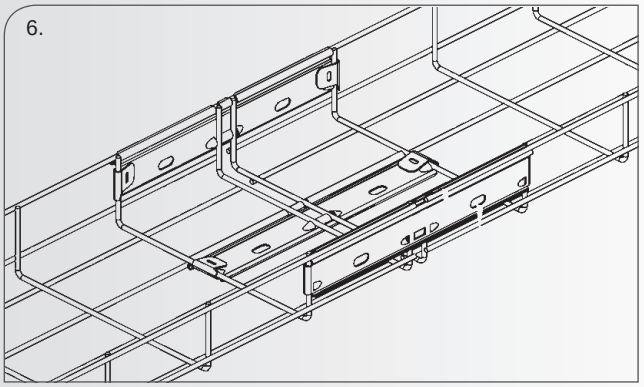


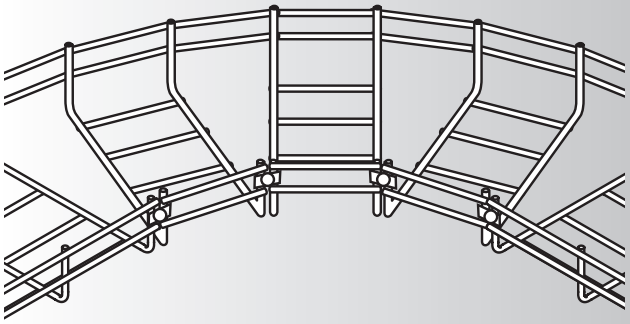
Splice Plate Requirements for Wire Mesh Basket Tray

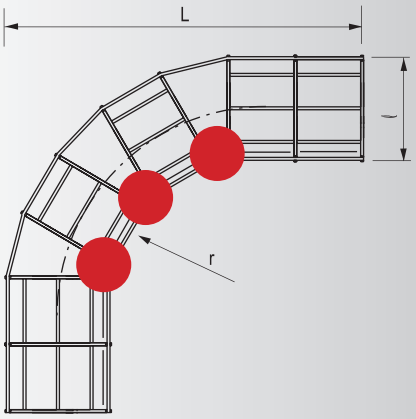
Wire Mesh Tray Model	Number of Splices	Finish E3 - 304 stainless steel	
		Standard	Boltless
GR 60.060	2	GRHKM 6X15 E3	GRVS 4 E3
GR 60.100	2	GRHKM 6X15 E3	GRVS 4 E3
GR 60.150	2	GRHKM 6X15 E3	GRVS 4 E3
GR 60.200	2	GRHKM 6X15 E3	GRVS 4 E3
GR 60.300	3	GRHKM 6X15 E3	GRVS 4 E3
GRS 60.100	2	GRHKM 6X15 E3	GRVS 5 E3
GRS 60.150	2	GRHKM 6X15 E3	GRVS 5 E3
GRS 60.200	2	GRHKM 6X15 E3	GRVS 5 E3
GRS 60.300	3	GRHKM 6X15 E3	GRVS 5 E3
GRS 60.400	3	GRHKM 6X15 E3	GRVS 5 E3
GRS 110.100	3	GRHKM 6X15 E3	GRVS 5 E3
GRS 110.200	4	GRHKM 6X15 E3	GRVS 5 E3
GRS 110.300	4	GRHKM 6X15 E3	GRVS 5 E3
GRS 110.400	4	GRHKM 6X15 E3	GRVS 5 E3

Two splices have to be installed on or close to the top lengthwire.
The third and fourth splice has to be uniformly distributed in the bottom section of the tray.

How to Build Wire Mesh Tray Fittings

Large Radius Elbows



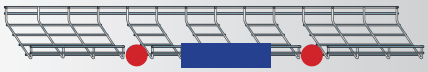


stands for (GTL 20 + GTL 30 + FLM 6x20)

stands for 1 x GTVL 300 + 4 GRHKM 6x15

W=100 mm 1 x GTVL 300 + 4 GRHKM 6x15

W=150 mm 2 x (GTL 20 + GTL 30 + FLM 6x20)
and 1 x GTVL 300 + 4 GRHKM 6x15



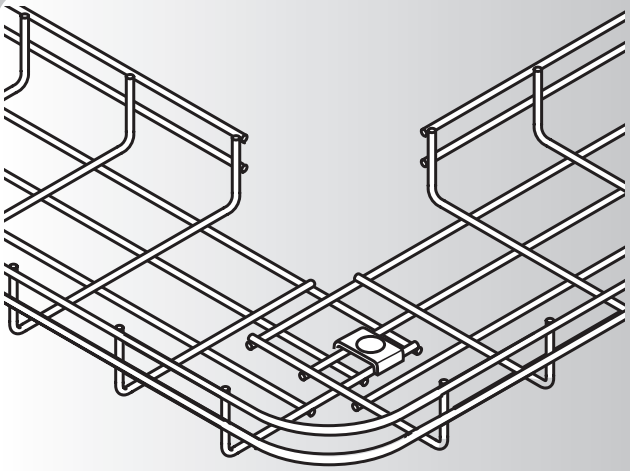
W=200 mm 2 x (GTL 20 + GTL 30 + FLM 6x20)
and 1 x GTVL 300 + 4 GRHKM 6x15

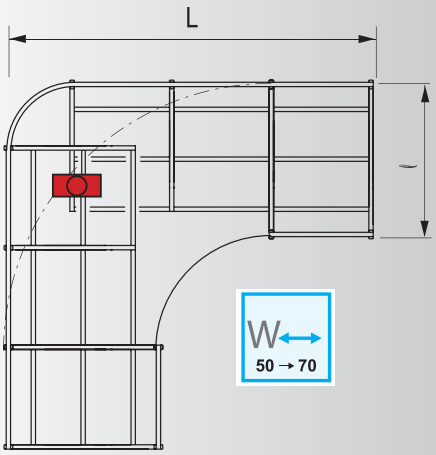
W=300 mm 4 x (GTL 20 + GTL 30 + FLM 6x20)
and 1 x GTVL 300 + 4 GRHKM 6x15

W=450 mm 6 x (GTL 20 + GTL 30 + FLM 6x20)
and 1 x GTVL 300 + 4 GRHKM 6x15

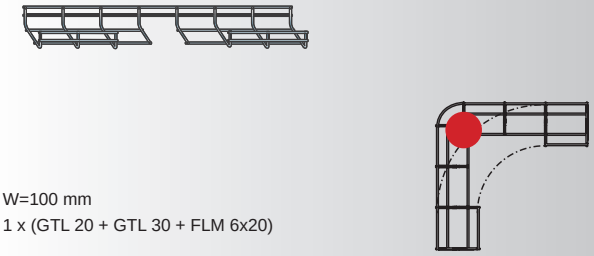
W=600 mm 8 x (GTL 20 + GTL 30 + FLM 6x20)
and 1 x GTVL 300 + 4 GRHKM 6x15

Small Radius Elbows

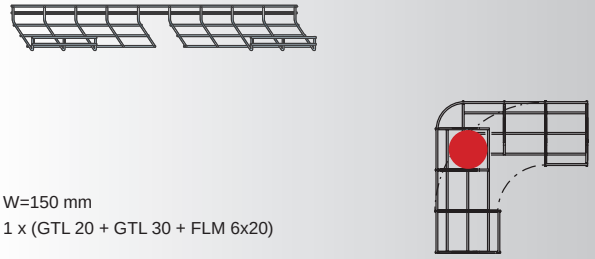




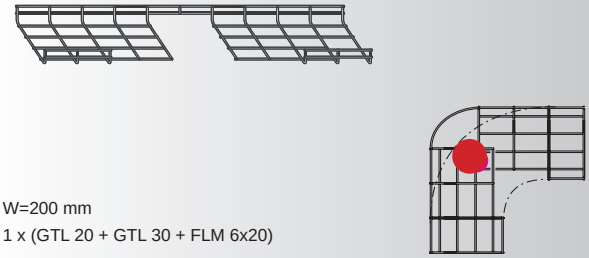
● stands for (GTL 20 + GTL 30 + FLM 6x20)



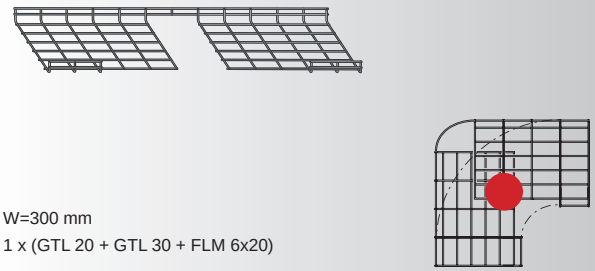
W=100 mm
1 x (GTL 20 + GTL 30 + FLM 6x20)



W=150 mm
1 x (GTL 20 + GTL 30 + FLM 6x20)



W=200 mm
1 x (GTL 20 + GTL 30 + FLM 6x20)



W=300 mm
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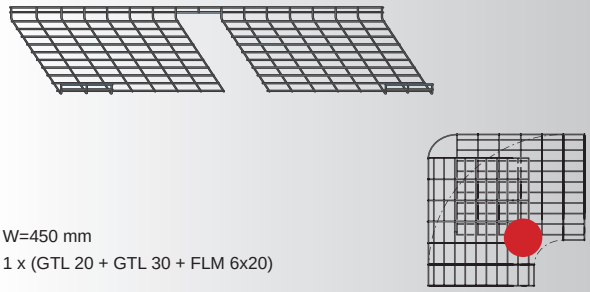
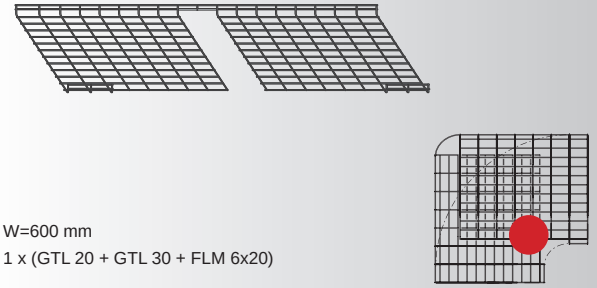


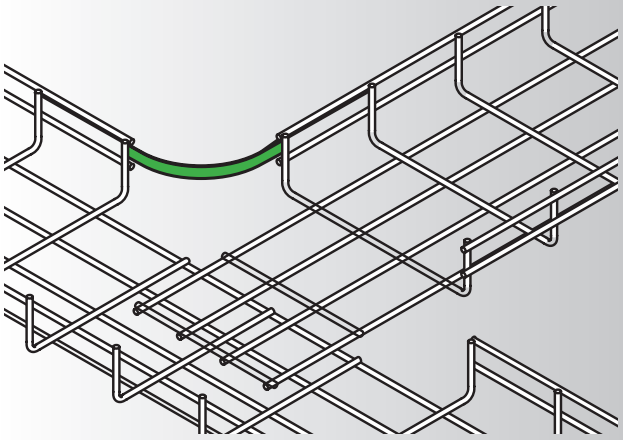
W=450 mm
1 x (GTL 20 + GTL 30 + FLM 6x20)

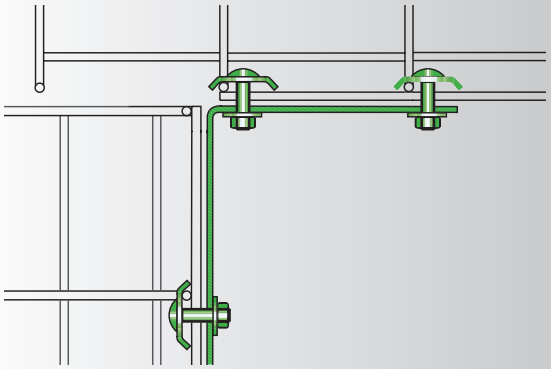


W=600 mm
1 x (GTL 20 + GTL 30 + FLM 6x20)

How to Build Wire Mesh Tray Fittings

Angular Tees



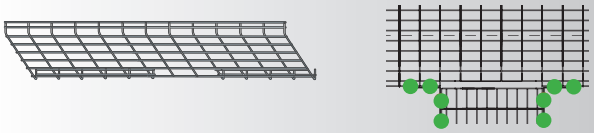


stands for GRHKM 6x15 or GRSM 6 fastener location

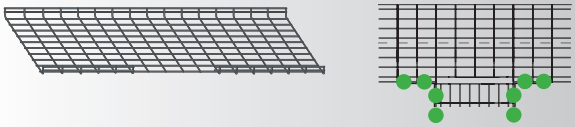
W=100 mm
8 x GRHKM 6x15 and 2 x GTVL 300

W=150 mm
8 x GRHKM 6x15 and 2 x GTVL 300

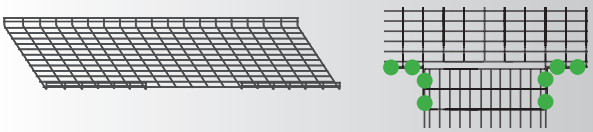
W=200 mm
8 x GRHKM 6x15 and 2 x GTVL 300



W=300 mm
8 x GRHKM 6x15 and 2 x GTVL 300



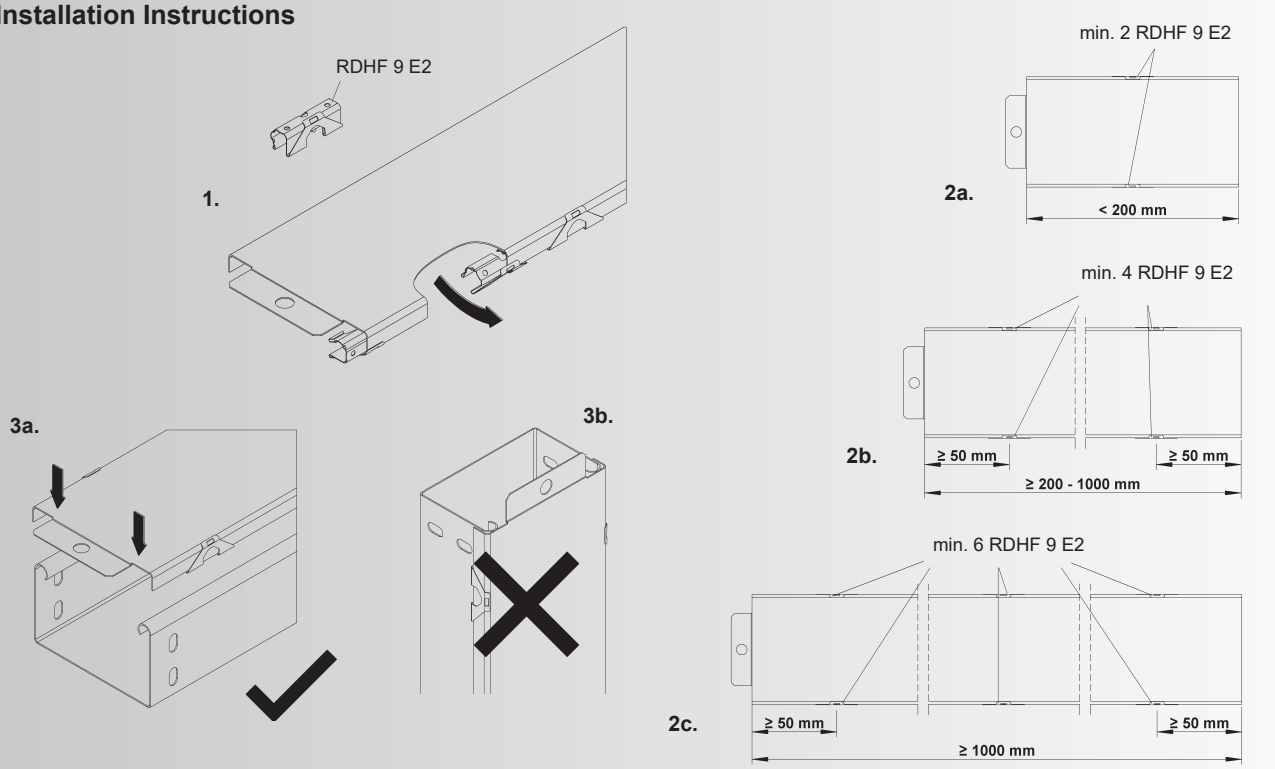
W=450 mm
8 x GRHKM 6x15 and 2 x GTVL 300



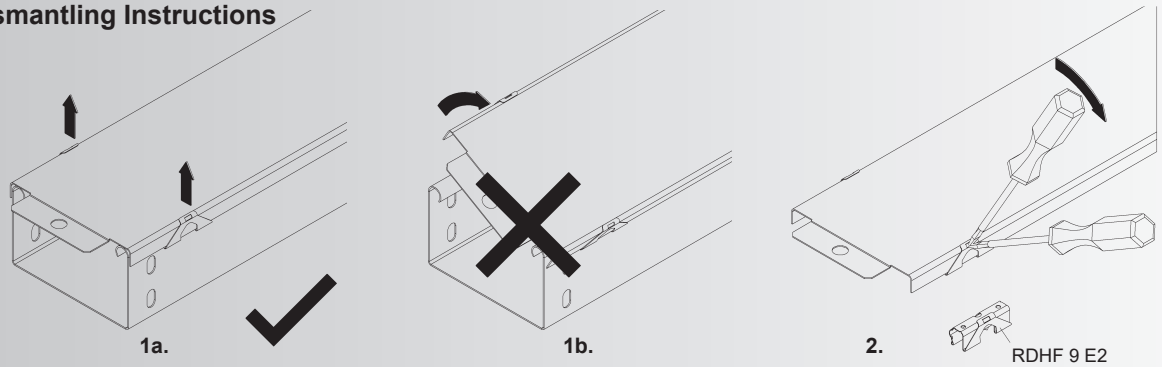
W=600 mm
8 x GRHKM 6x15 and 2 x GTVL 300

RDHF 9 E2

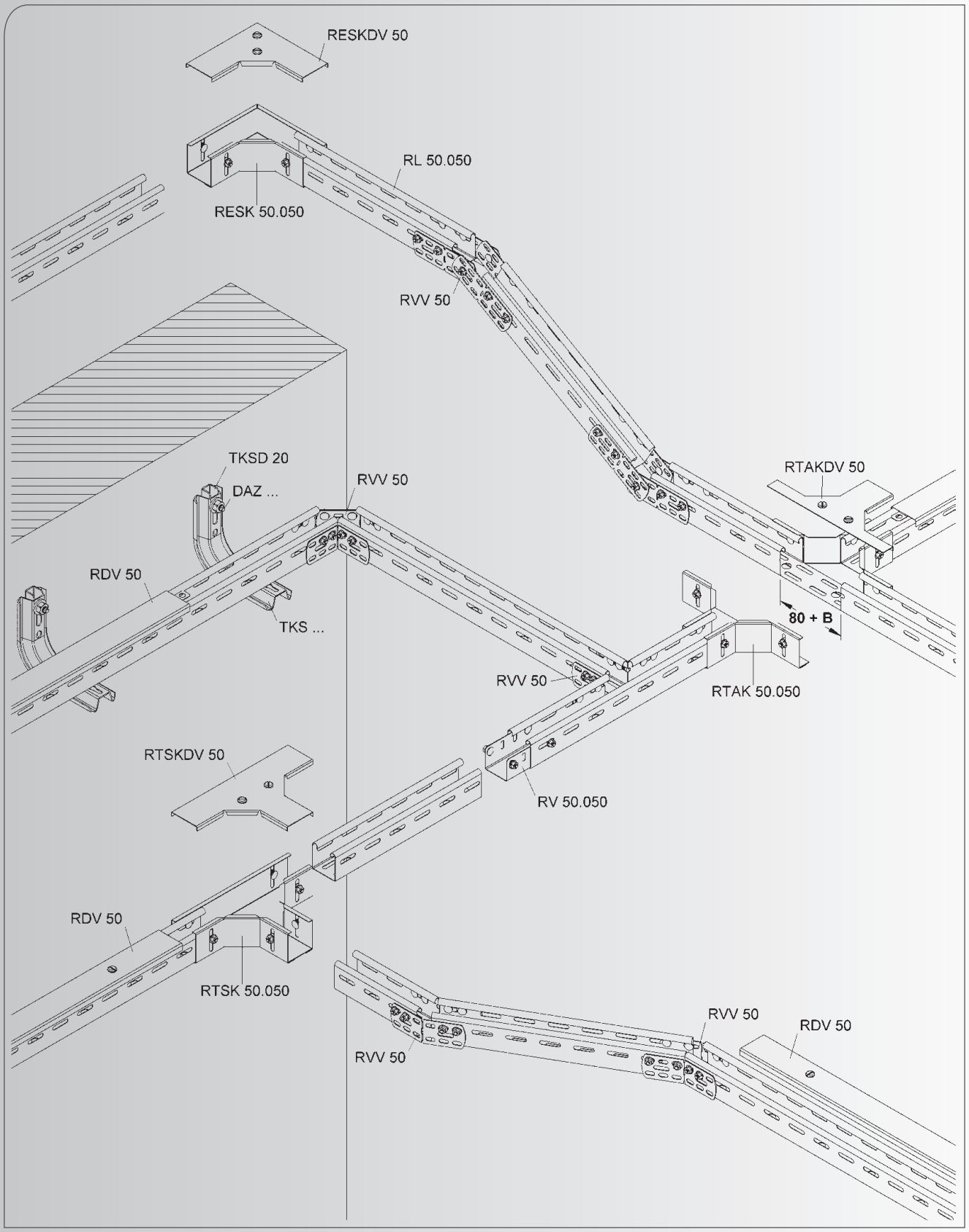
Installation Instructions



Dismantling Instructions



Installation Instructions



Extension Horizontal Tee **RTAK... , RTA...**

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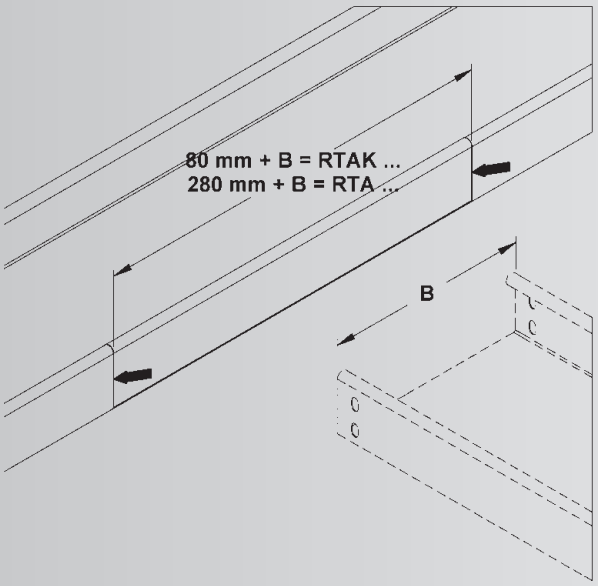

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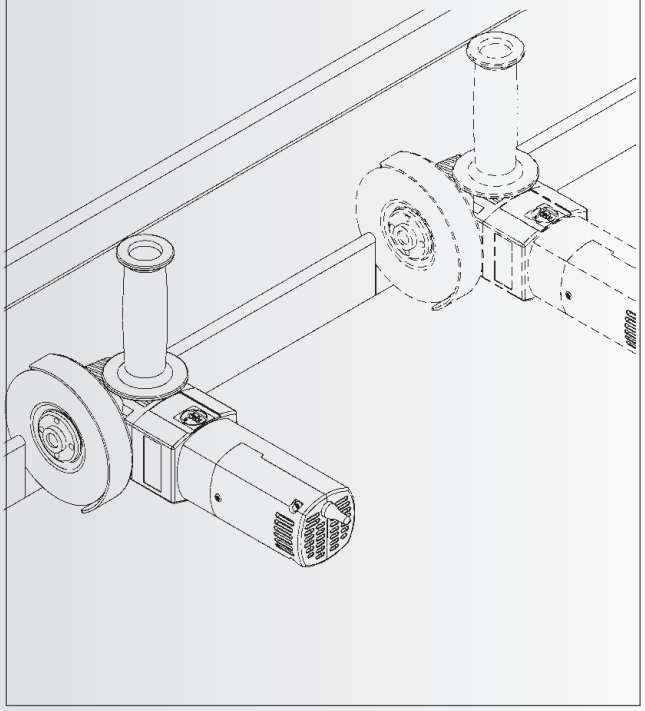

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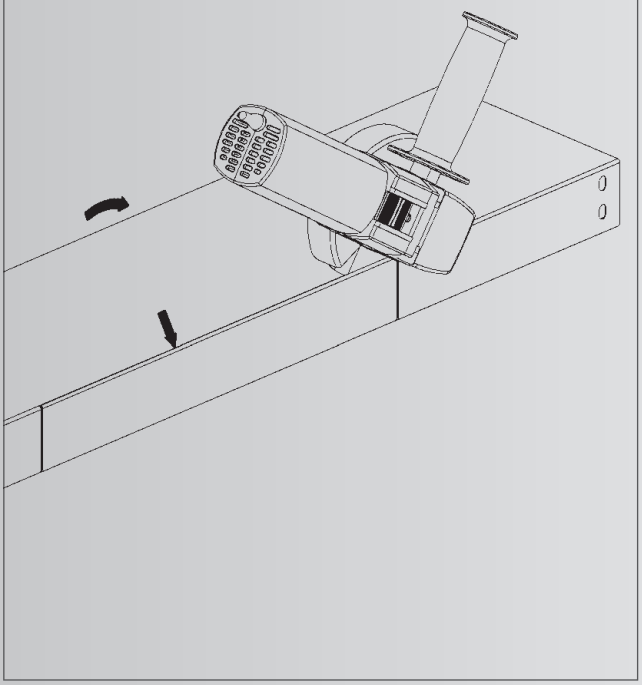

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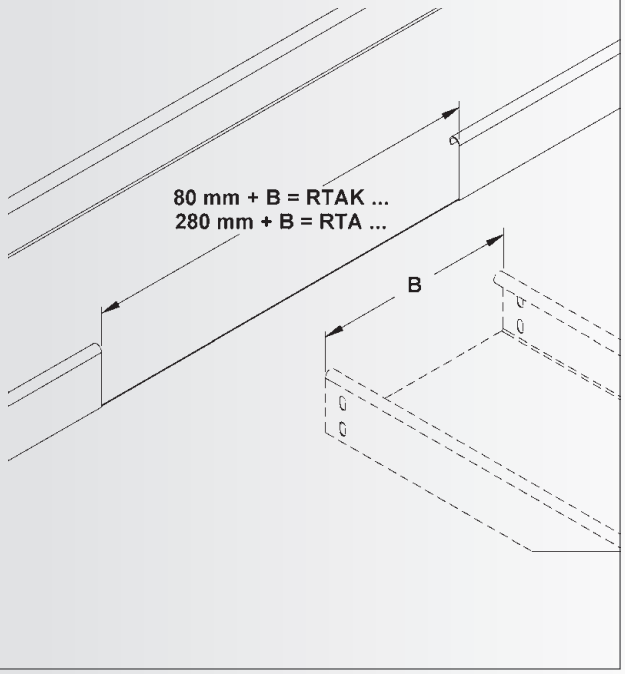
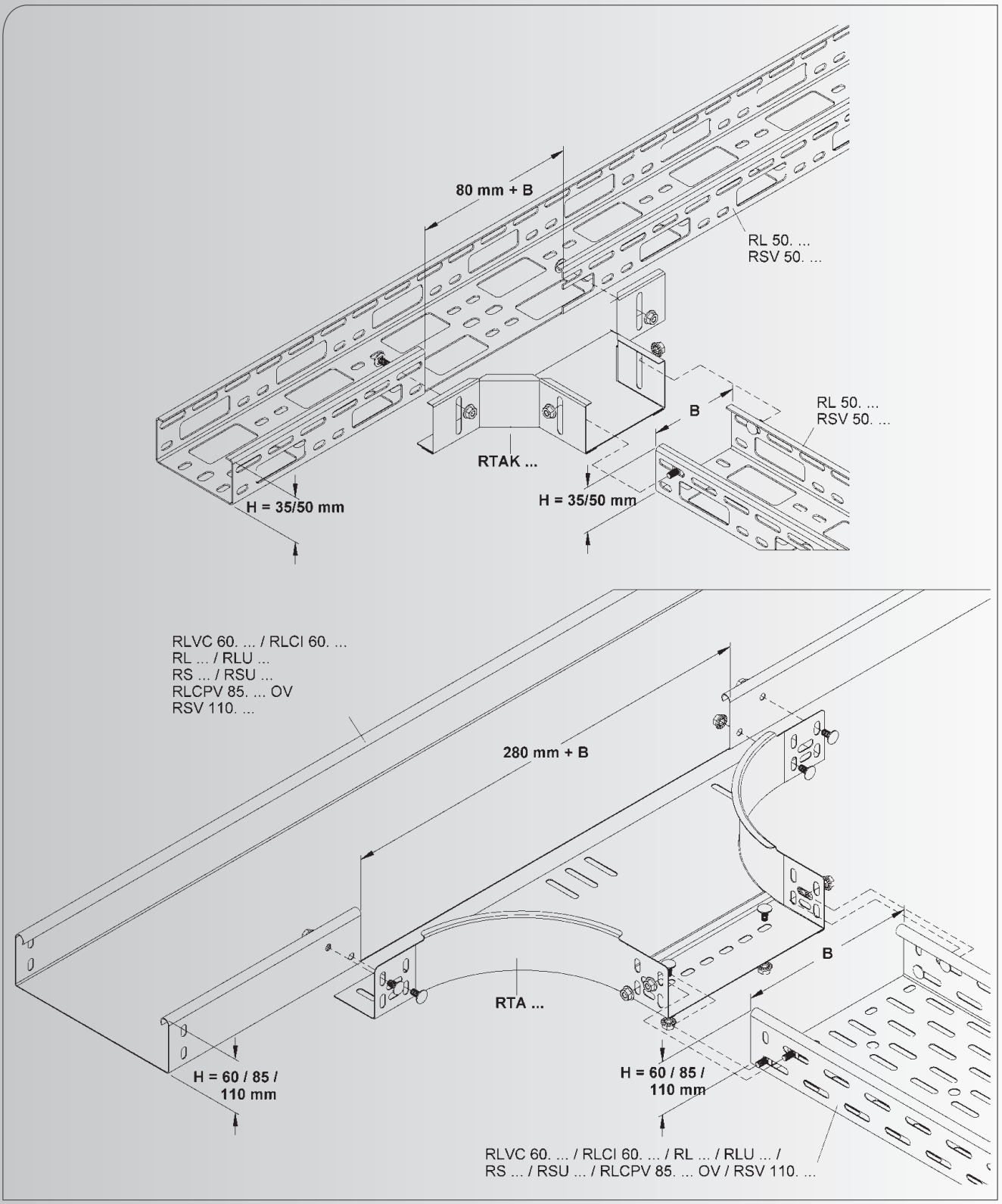
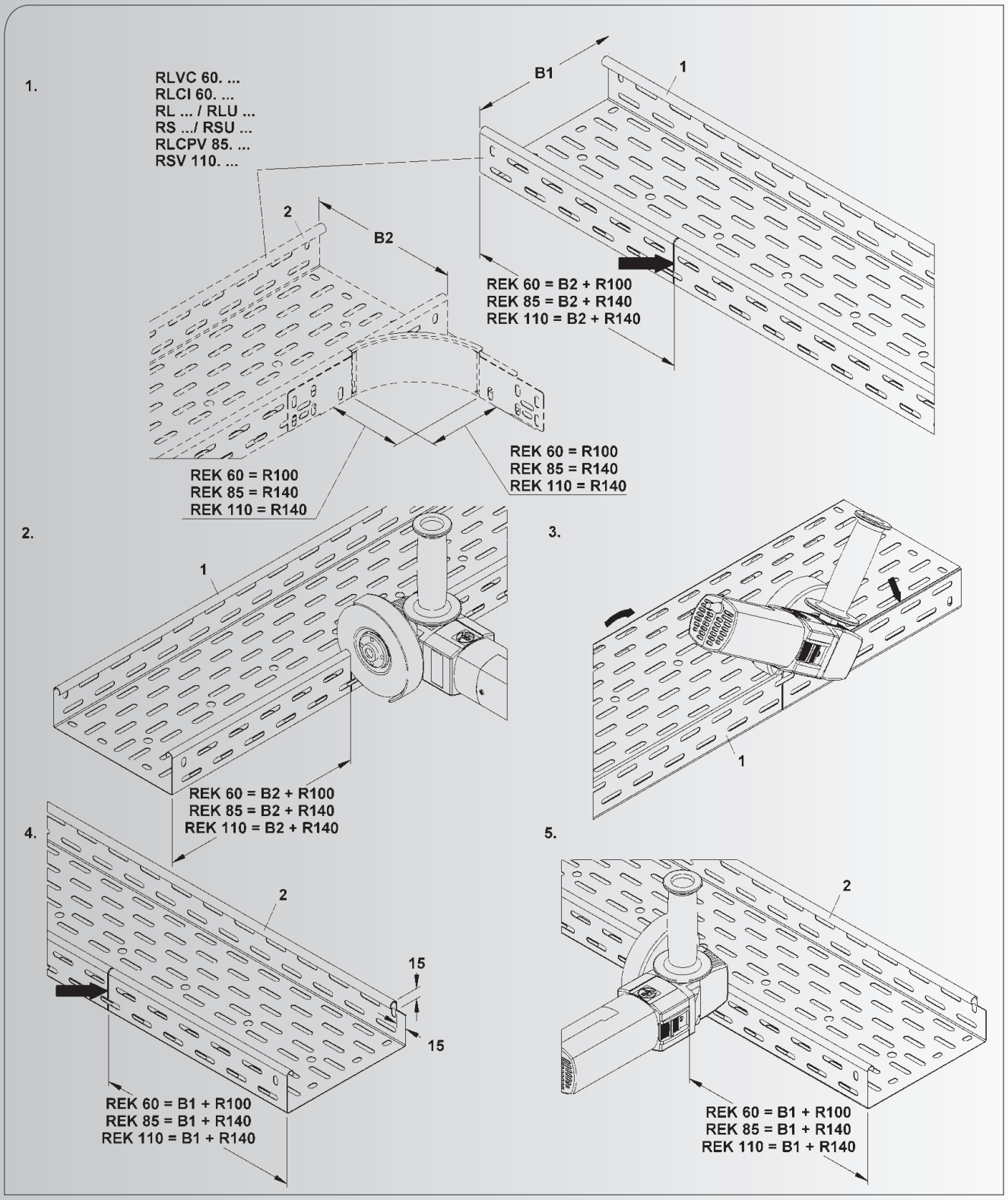


Installation Instructions

Extension Horizontal Tee **RTAK... , RTA...**



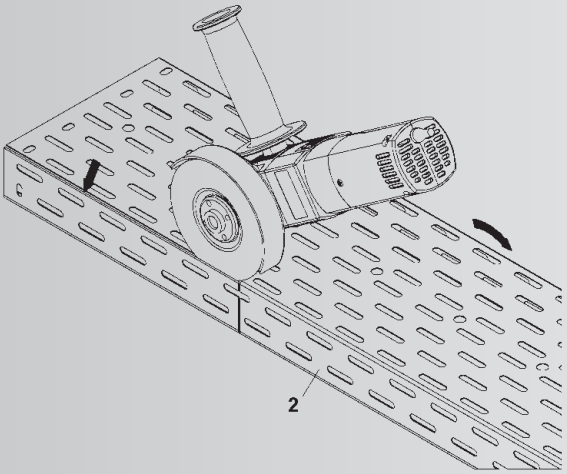
Horizontal Elbow Building Block **REK...**



Installation Instructions

Horizontal Elbow Building Block **REK...**

6.



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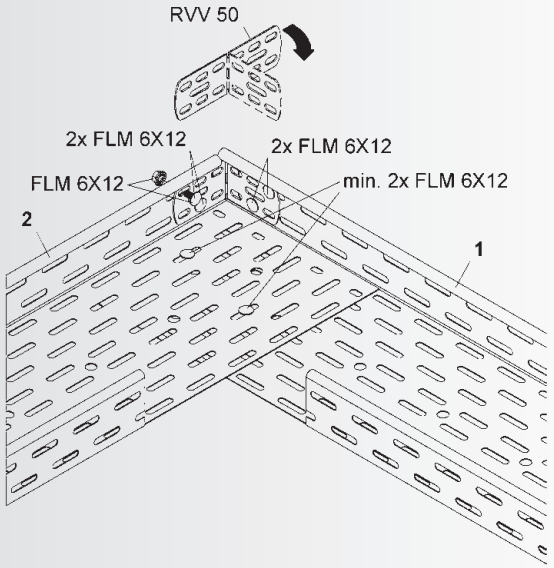

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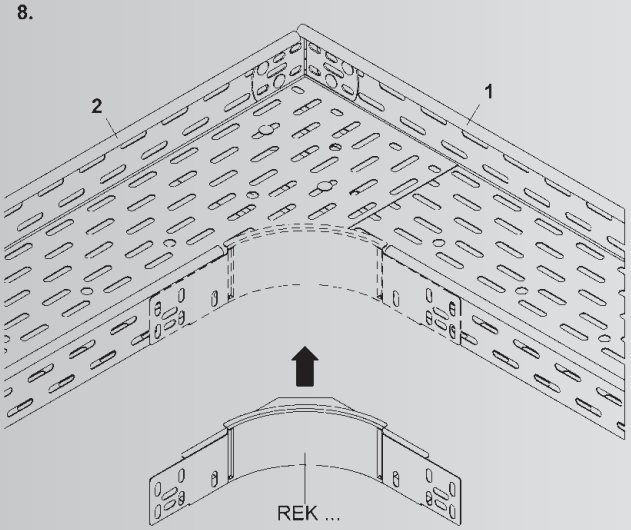

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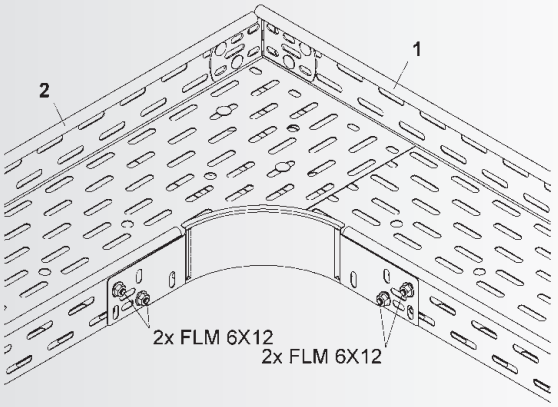

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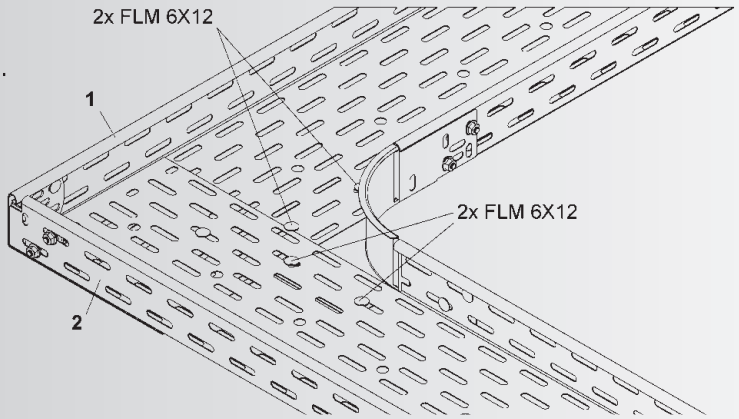
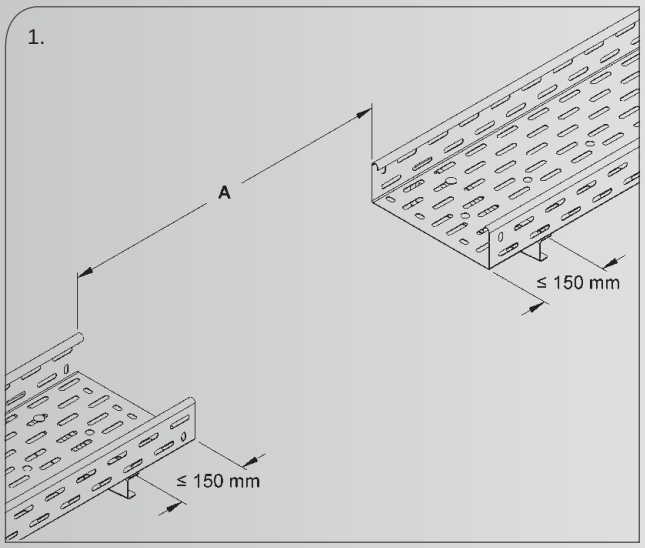


RTL... Vertical Tee Down, lengthwise

1.



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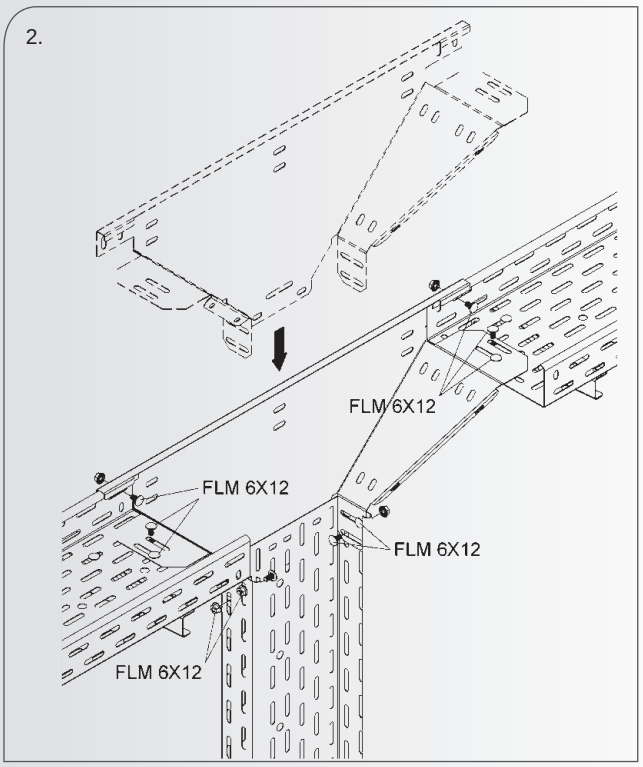

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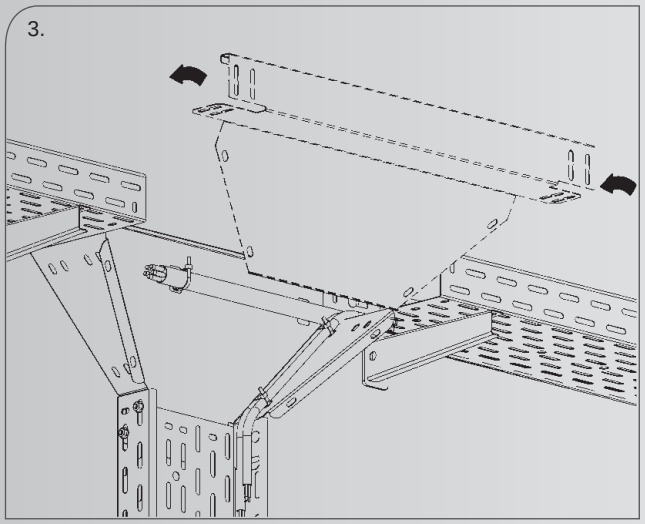

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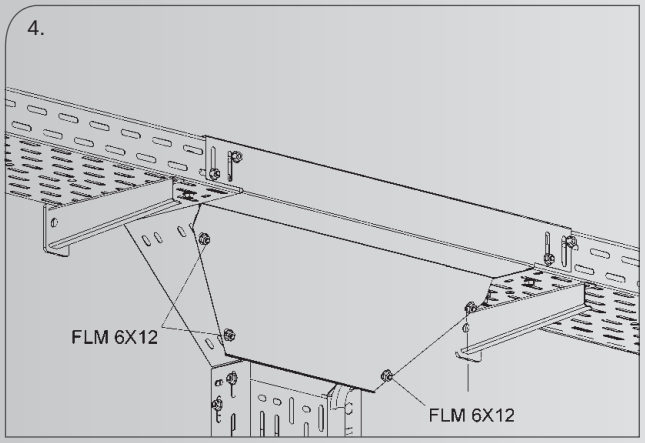

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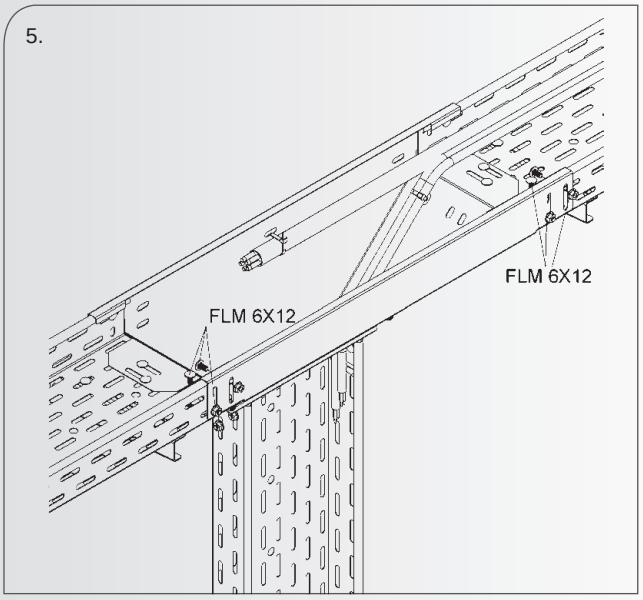
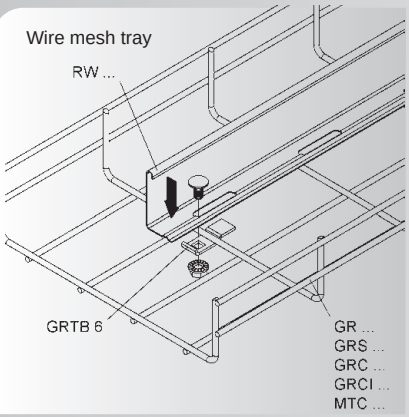


Installation Instructions

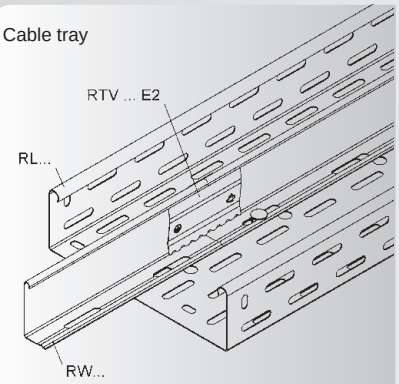
RW...

Installing barrier strips to wire mesh or cable tray

Wire mesh tray

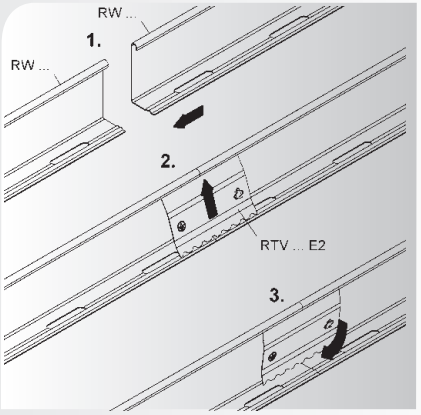


Cable tray

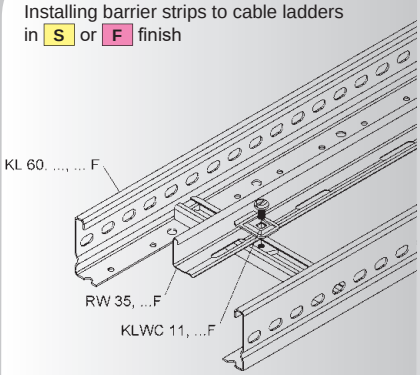


RTV...

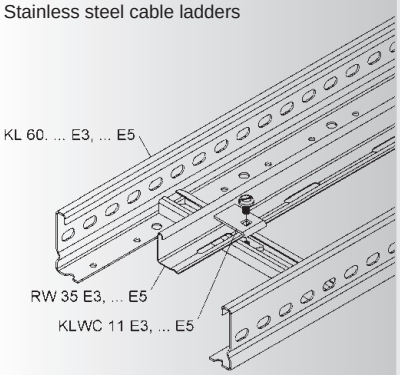
Installing barrier strip splice plates



Installing barrier strips to cable ladders in S or F finish

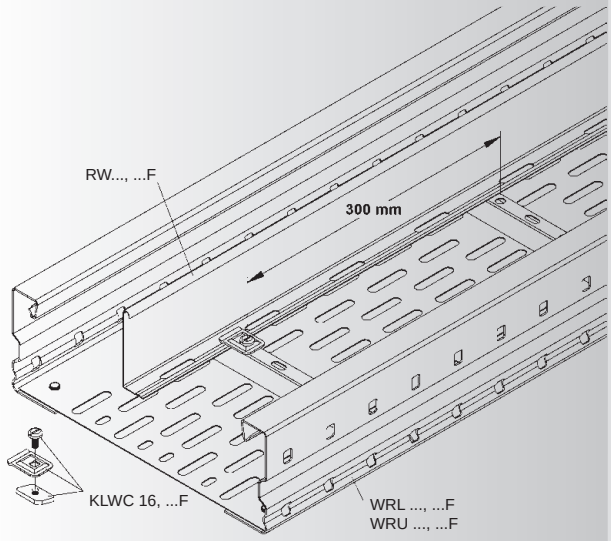


Stainless steel cable ladders

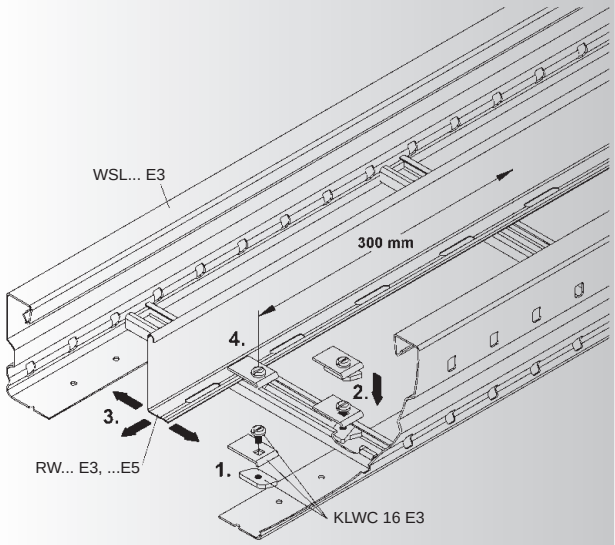


Installing barrier strips to long span tray or ladder

Long Span Tray (use one KLWC 16... on every second rung)



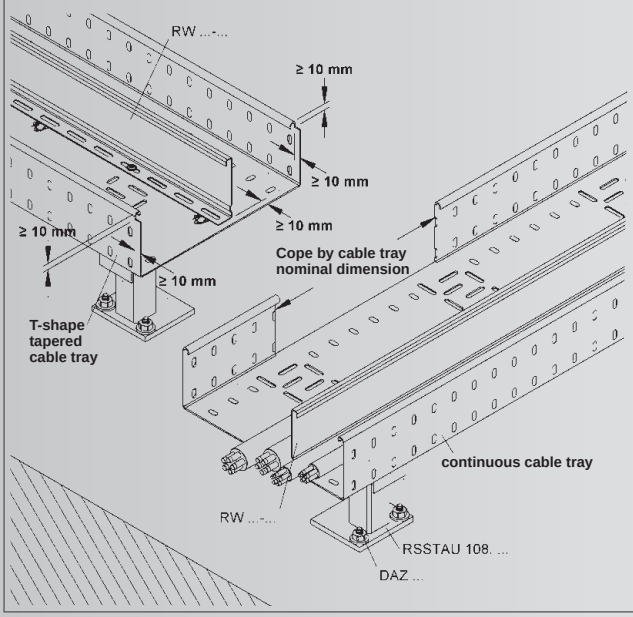
Long Span Ladder (use one KLWC 16 E3 on every second rung)
Please preassemble the KLWC 16 E3 before inserting the sliding nut into the rung.



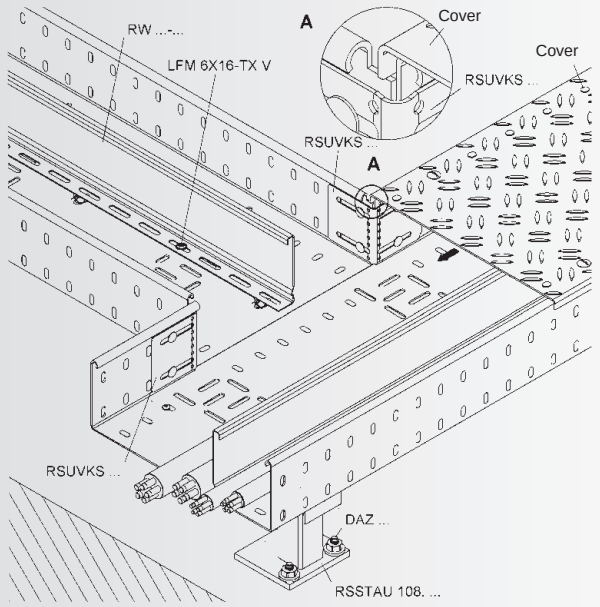
RSUVKS...

Forming a tee joint with the **RSUVKS...** splice plate

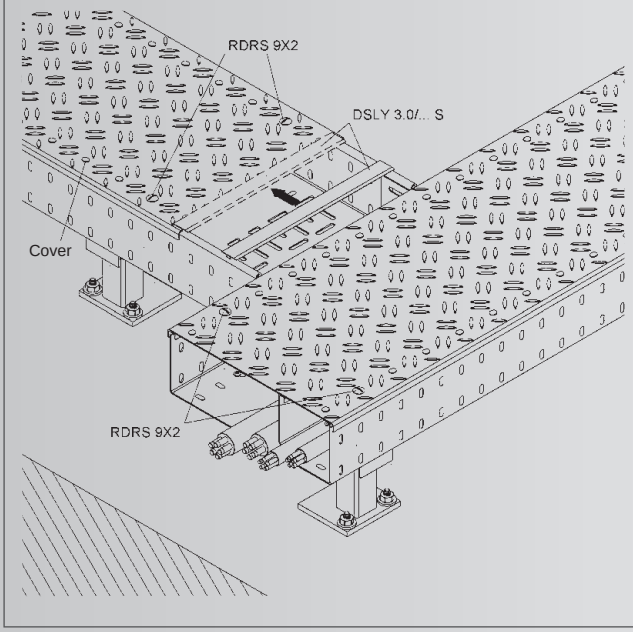
1. Remove a section of the side rail on the continuous cable tray to match the nominal size of the cable tray running into it to form the tee shape. Remove the rolled straight edge in the area of the joint on both sides according to the diagram.



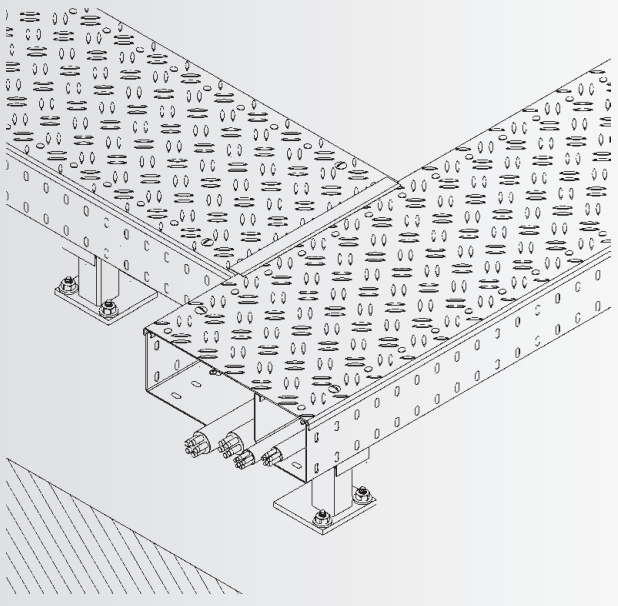
2. Connect the cable trays forming the tee shape at the joint using RSUVKS... universal splice plates.
The cover on the continuous cable tray can be easily fitted or slid through the gaps.



3. Attach a DSLY 3.0/... cover protection strip with its insertion slots onto the cover of the tee joint.



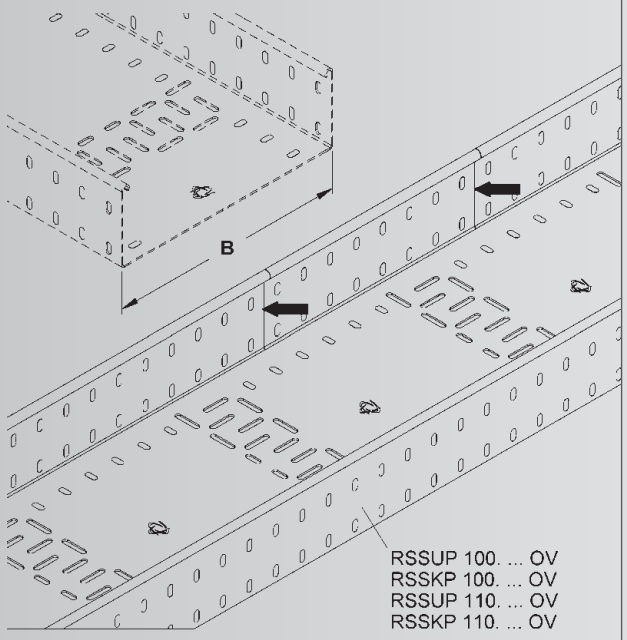
4. Slide the protection strip and the cover towards the cover of the continuous cable tray.



Installation Instructions

Cable trays RSSUP...OV and RSSKP...OV for walkable cable tray system

1.



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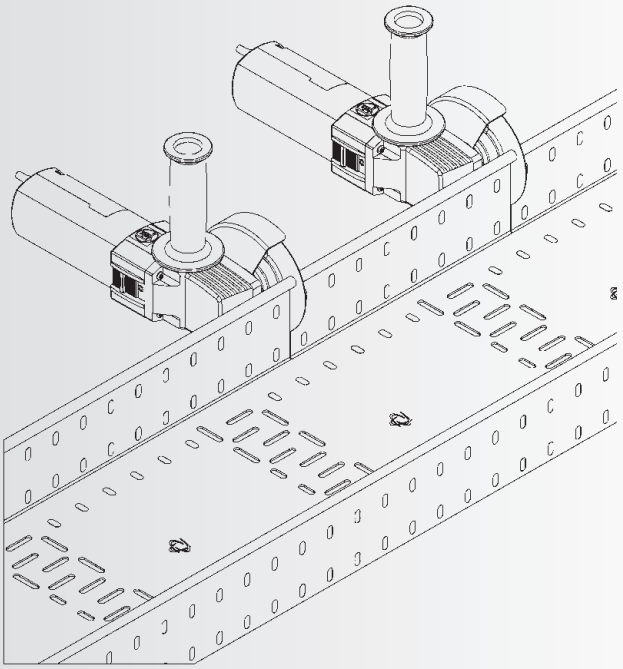

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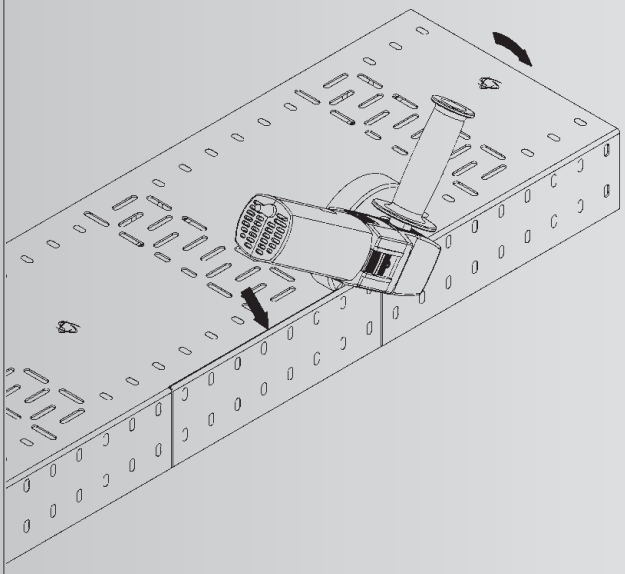

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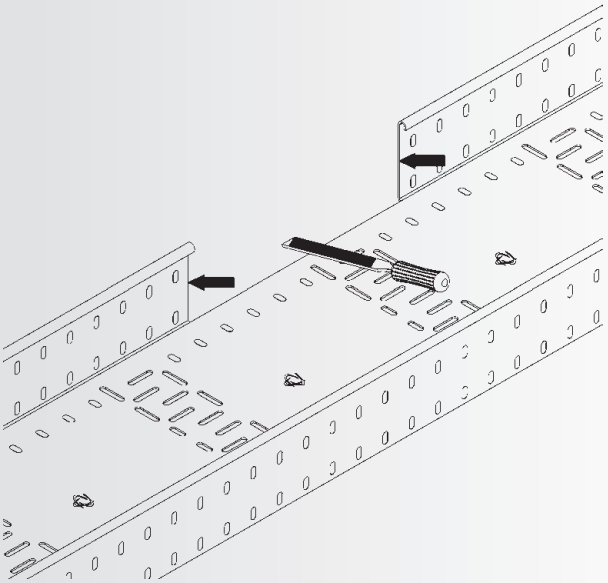
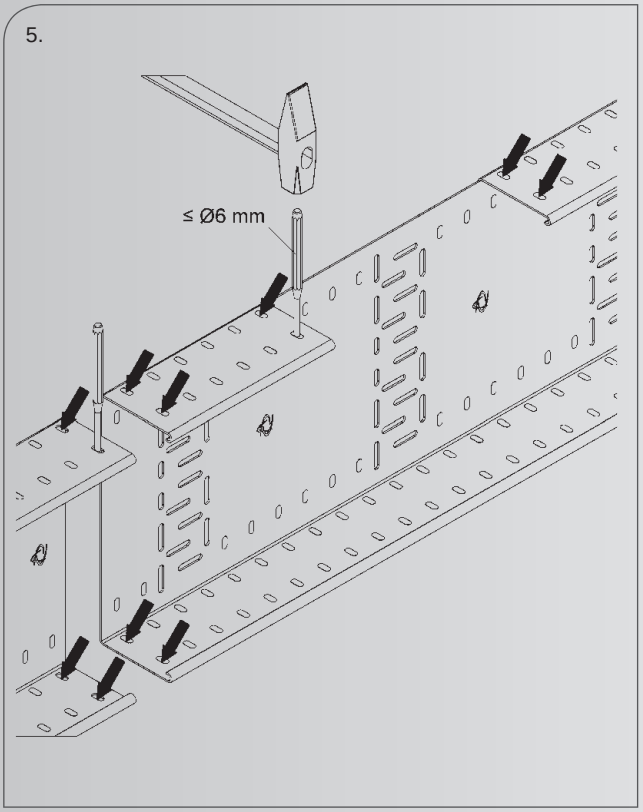


Cable trays RSSUP...OV and RSSKP...OV for walkable cable tray system

5.



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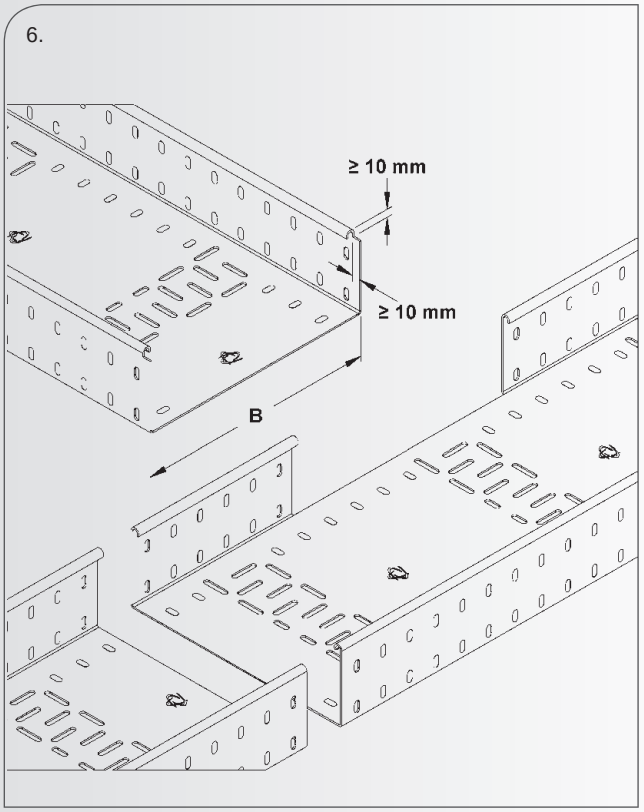

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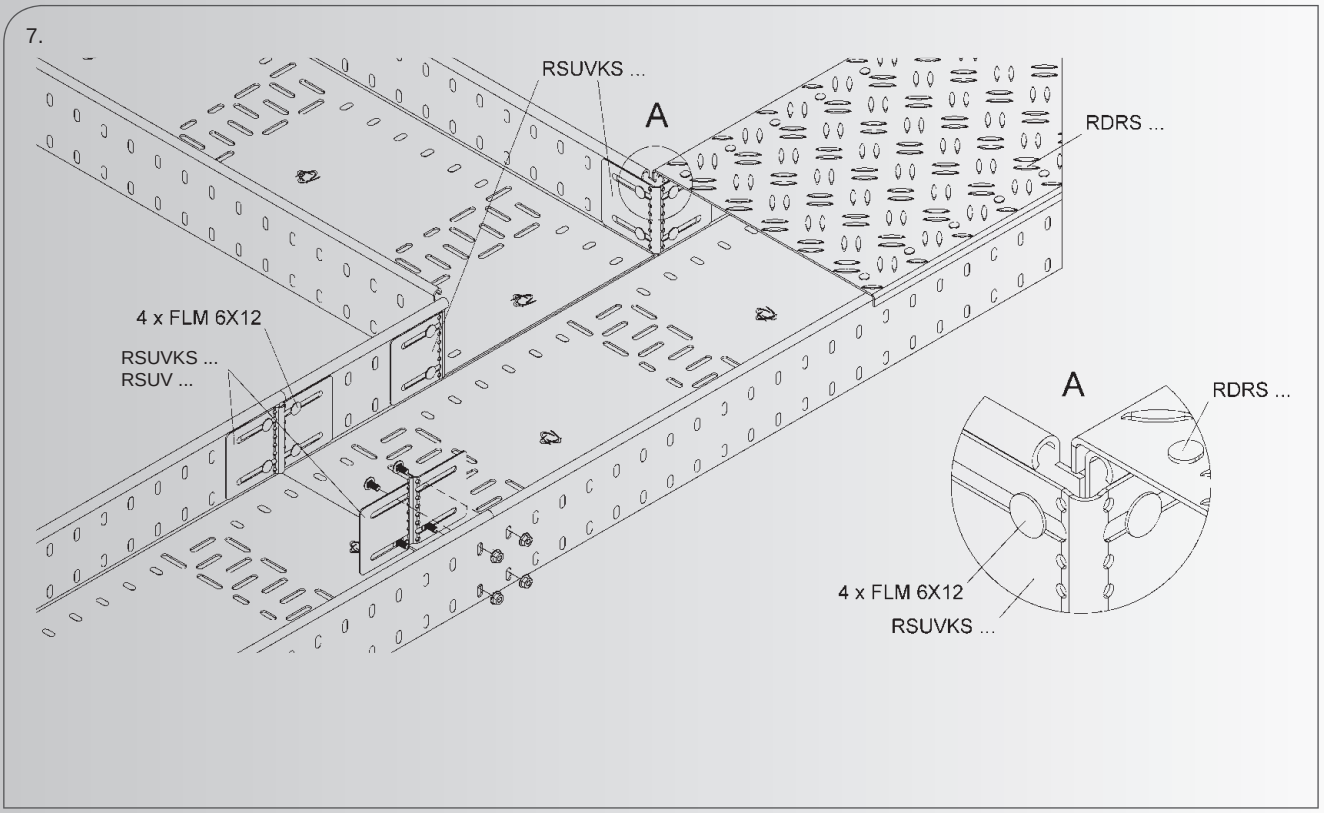
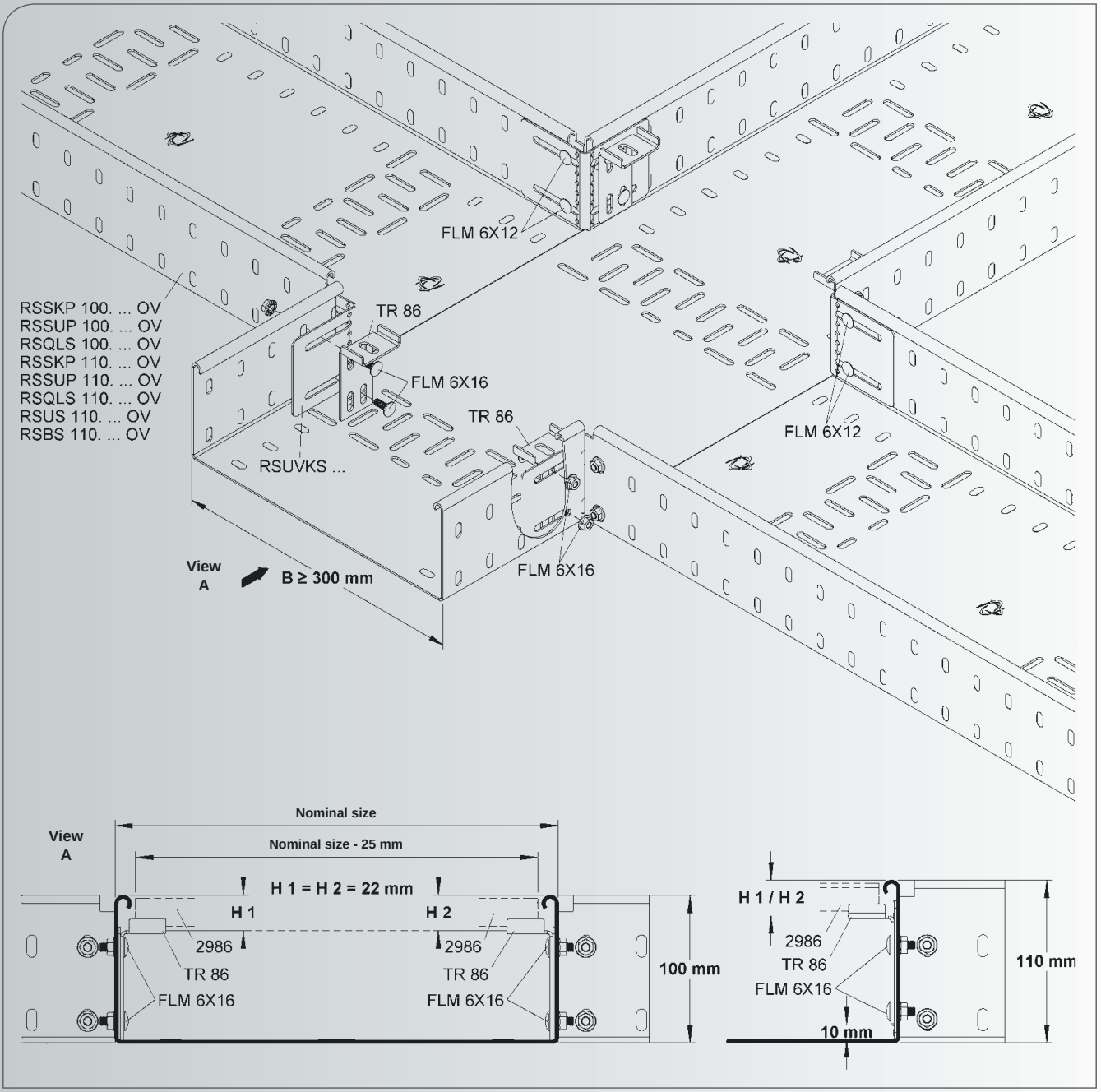


Installation Instructions

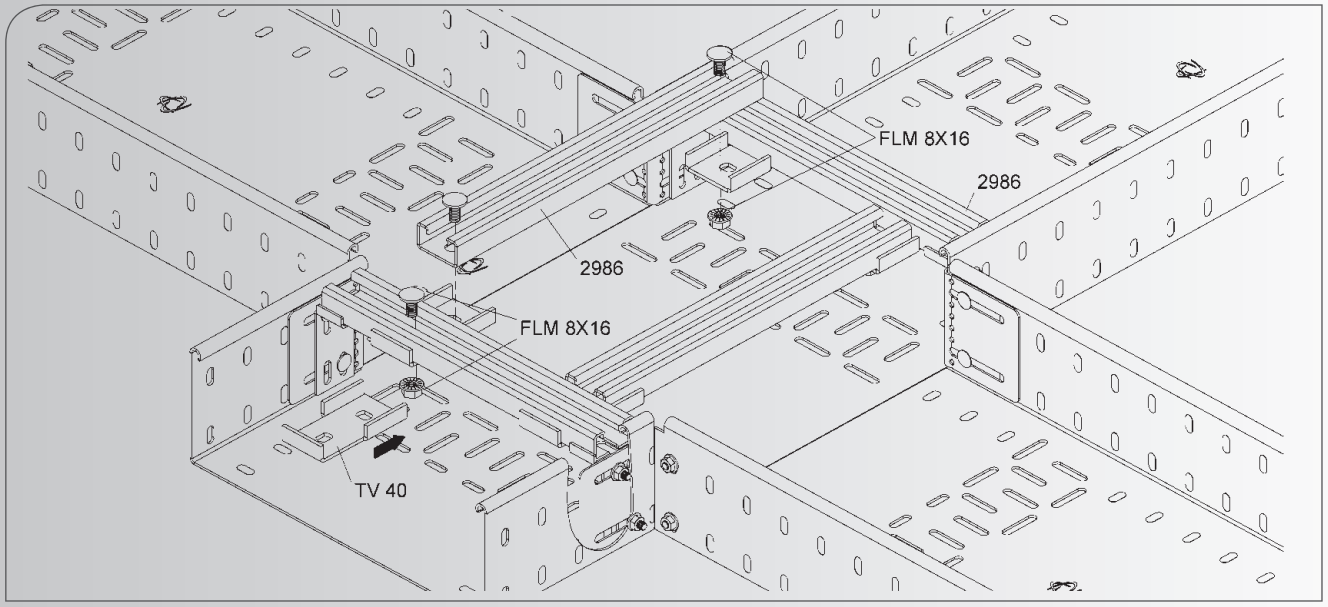
TR 86 S

Support TR 86 S in conjunction with C-profile 2986 for cover support without barrier strip assembly.

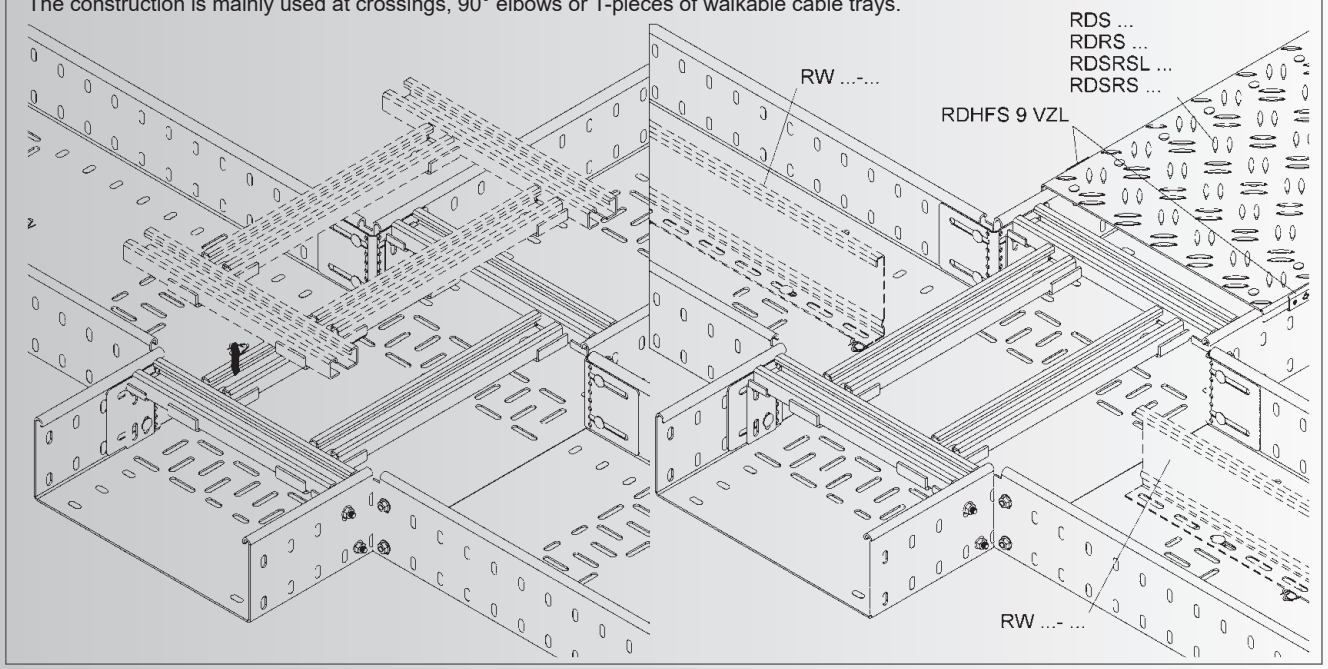


TR 86 S

Support TR 86 S in conjunction with C-profile 2986 for cover support without barrier strip assembly.



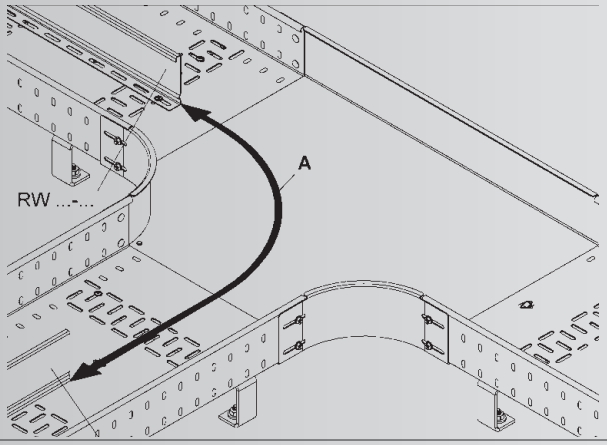
Flexible dismantling of the rails eliminates the need to thread the cables.
The construction is mainly used at crossings, 90° elbows or T-pieces of walkable cable trays.



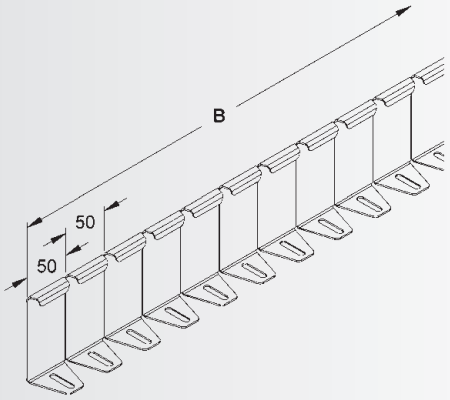
Installation Instructions

RTSQF...

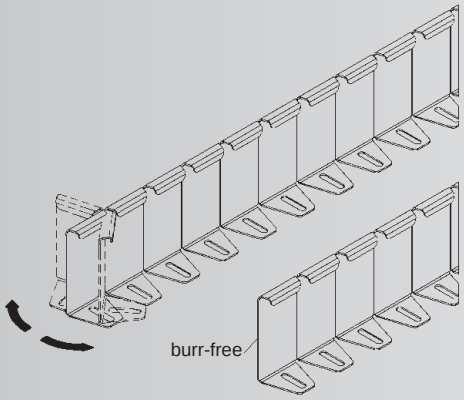
1. Measure the approx. required length **(A)** of the RTSQF… barrier strip



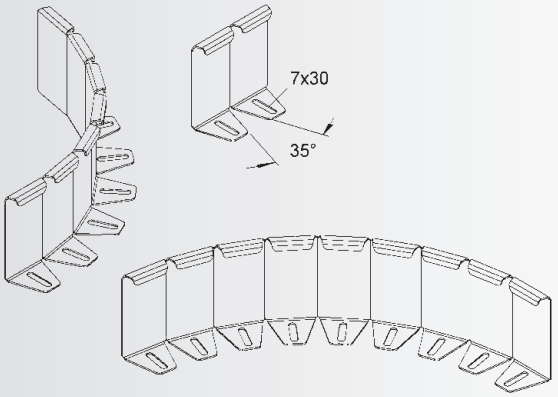
2. The 50 mm segments make it easier to measure and cut the barrier strip **(B)** to the approximate length required.



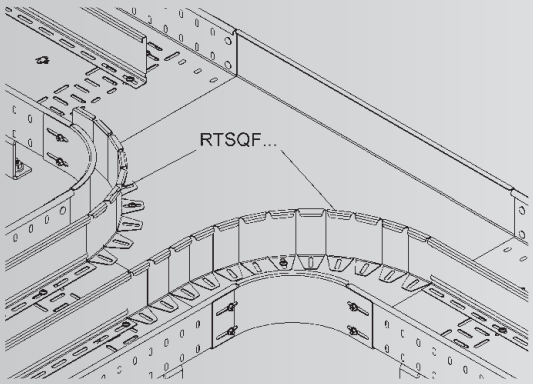
3. The barrier strip can be shortened by 50 mm per segment in each case by bending over the relevant segment(s) multiple times to each side.



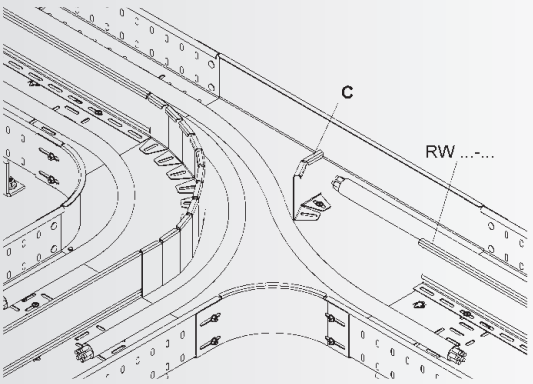
4. Flexible adjustments to the barrier strip can be easily achieved by hand without the need for tools. It is possible to adjust the form of the barrier strip in both directions.



5. Inserting the RTSQF... flexible barrier strip will create a continuous partition in the tray compartment and also provides linked support to the fitted cover in one step.



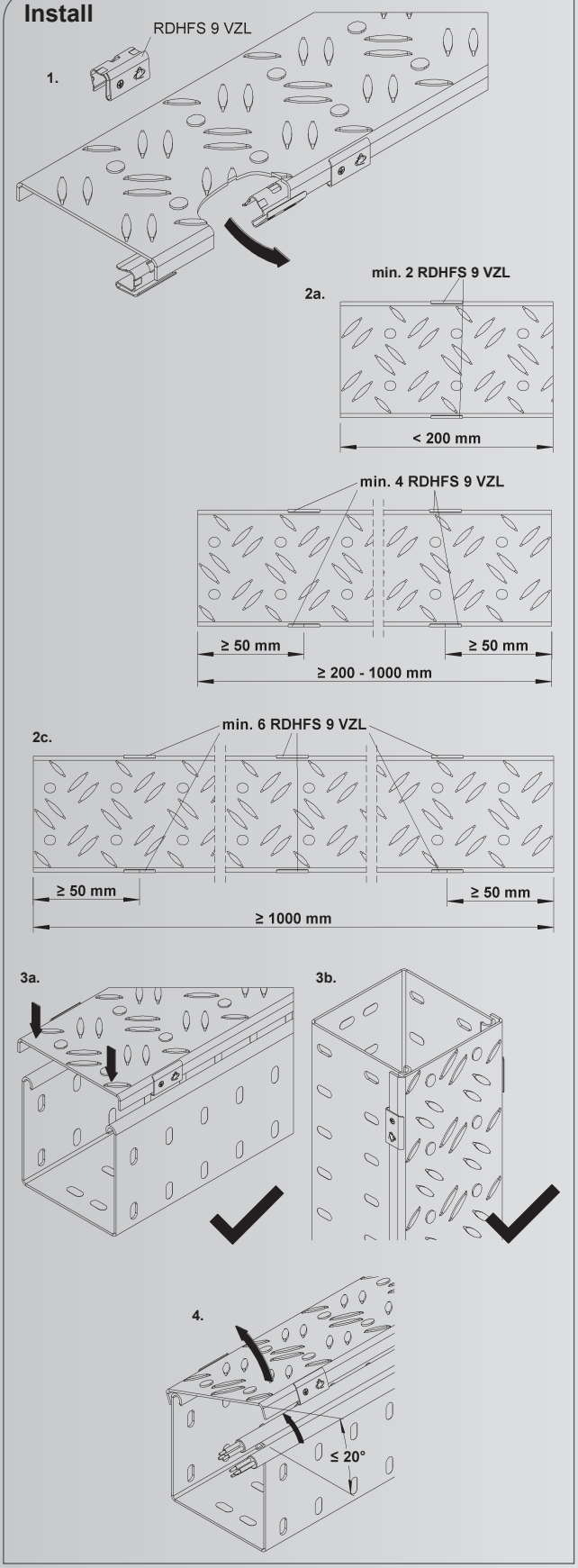
6. If required, individual or multiple segments **(C)** can be used to provide additional support for the fitted cover.



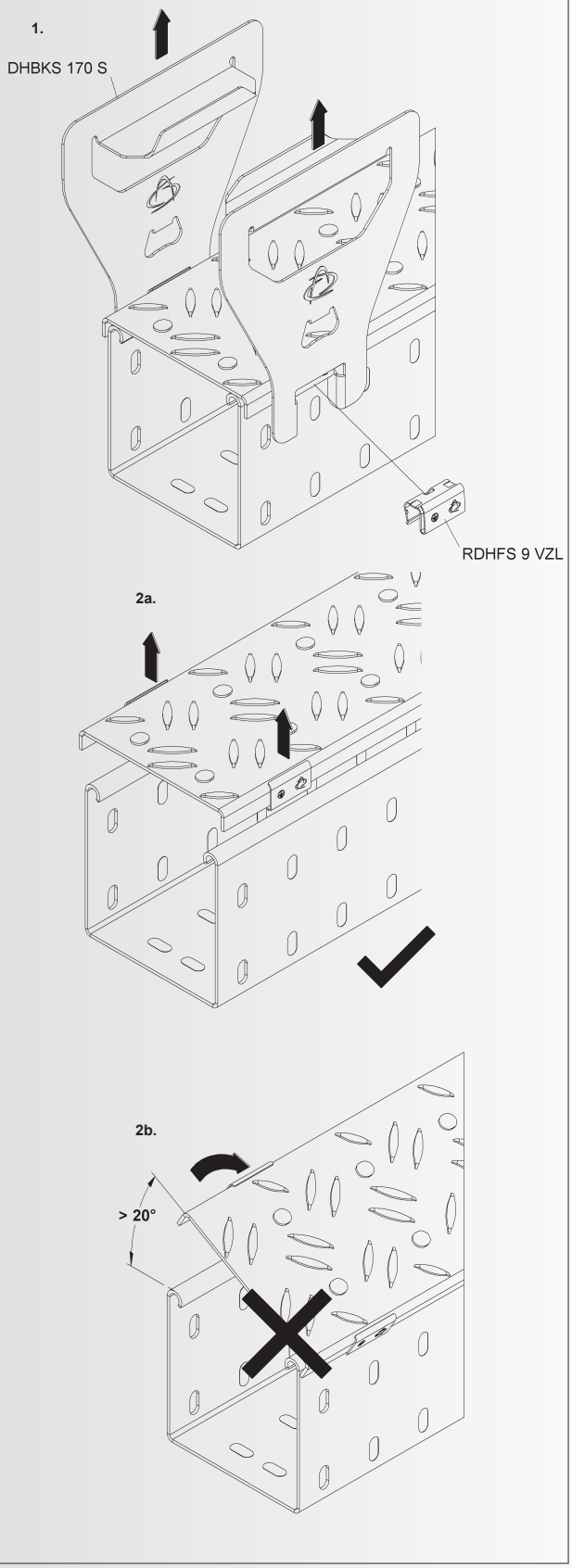
Installation Instructions

How to install/deinstall the cover clamp RDHFS 9 VZL

Install



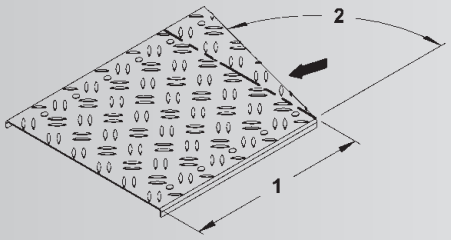
Deinstall



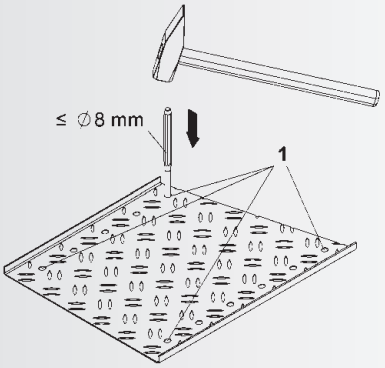
Installation Instructions

Preparing the RDRS... anti-slip cable tray cover for fitting with the RDRS 9X2 turnbolt lock

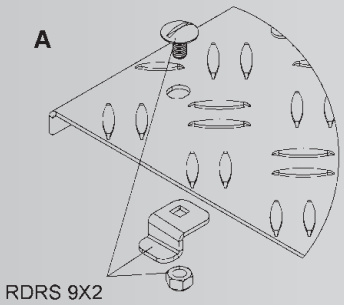
1. Cut the cover at a right angle **(1)** or the corresponding angle for the change of direction **(2)**.

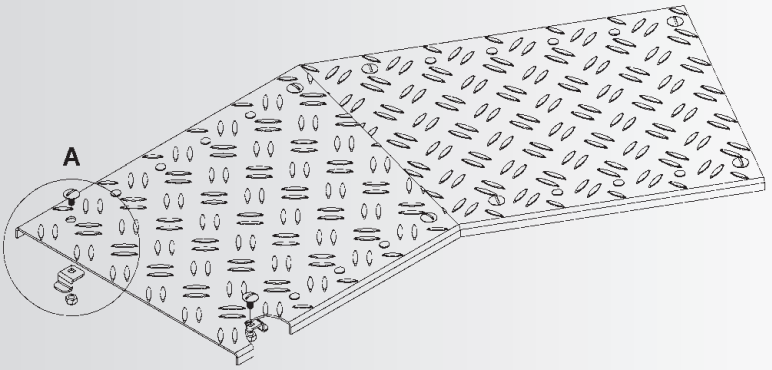


2. Turn the cover over and use a punch to remove the knockouts nearest to the cutting edge **(1)**.

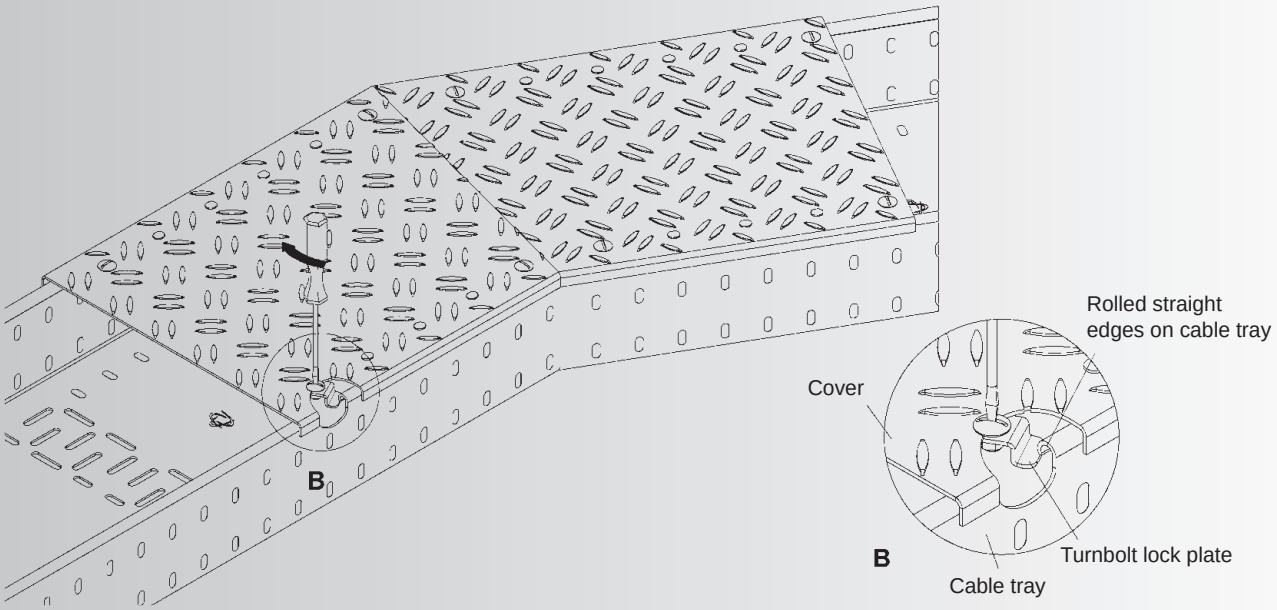


3. Prefit the **RDRS 9X2** turnbolt lock as required.



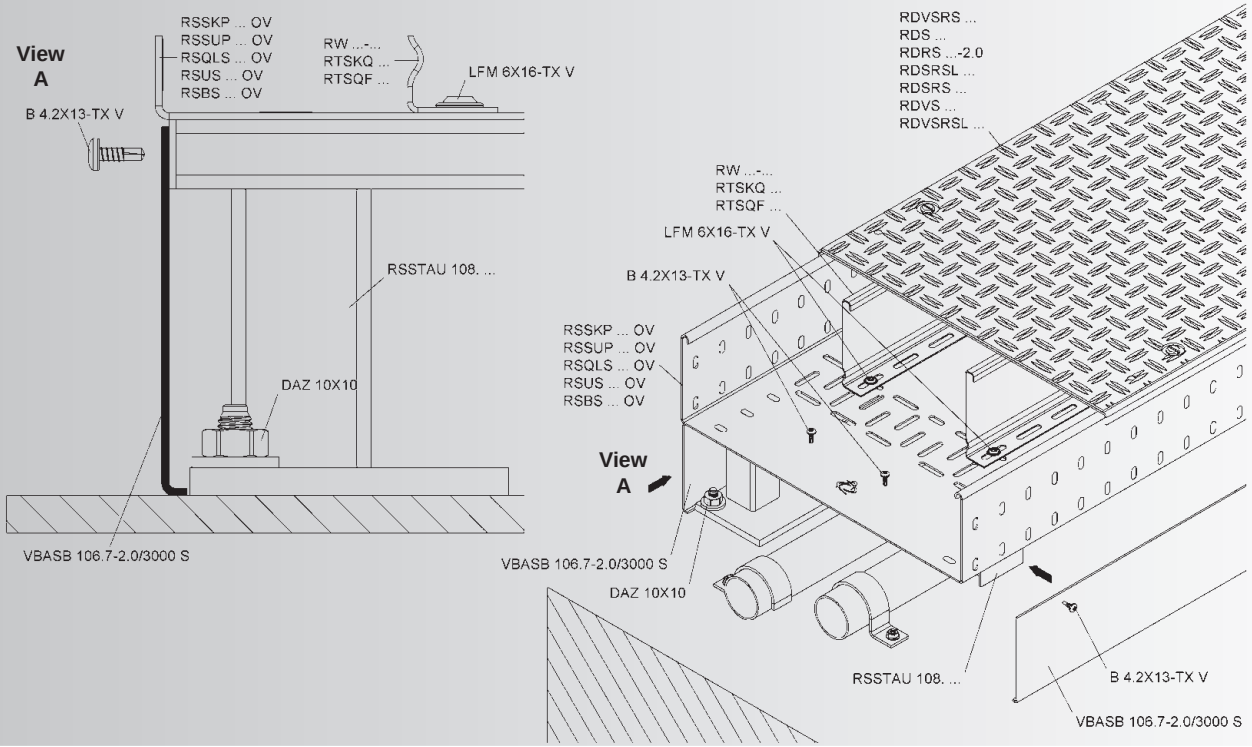


4. Place the **RDRS...** cable tray cover onto the cable tray and use a screwdriver to screw in the turnbolt locks. The plate on the turnbolt lock grips under the rolled straight edges of the cable tray and thus guarantees a tight connection between the cover and the cable tray.

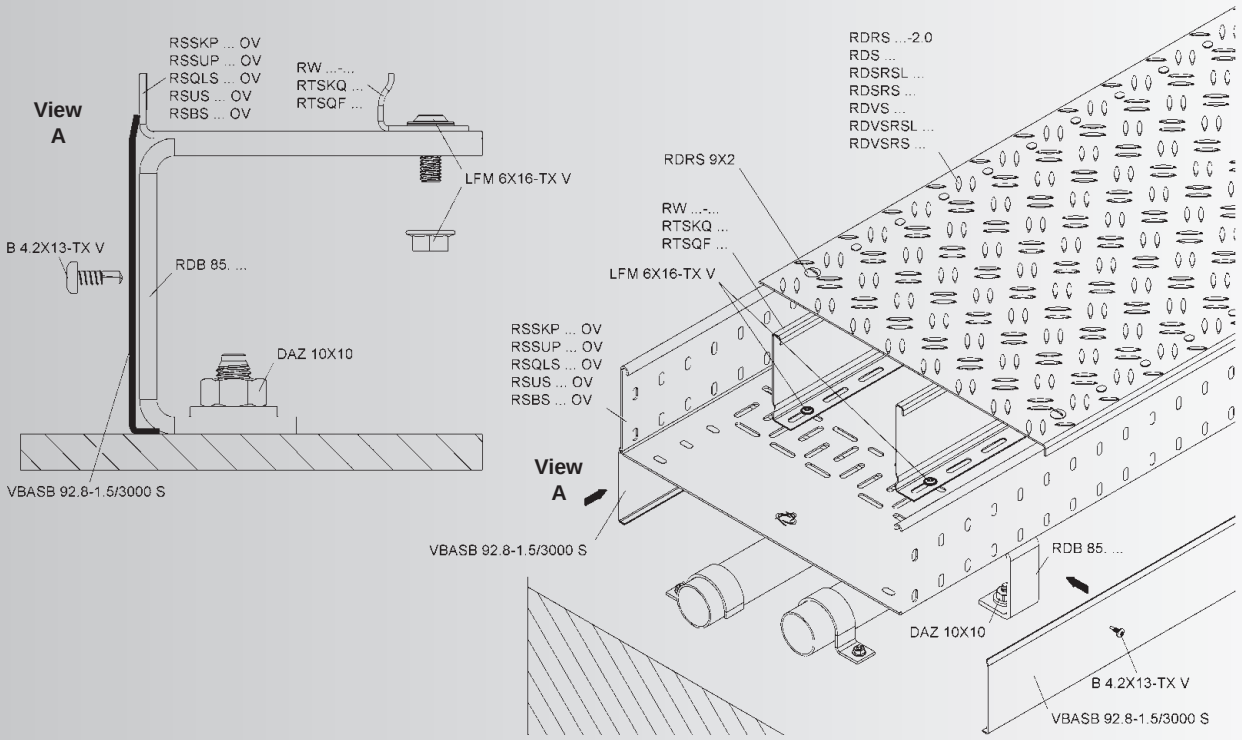


Installation Instructions

How to Install Skirting Penels to RSSTAU 108... Floorstands

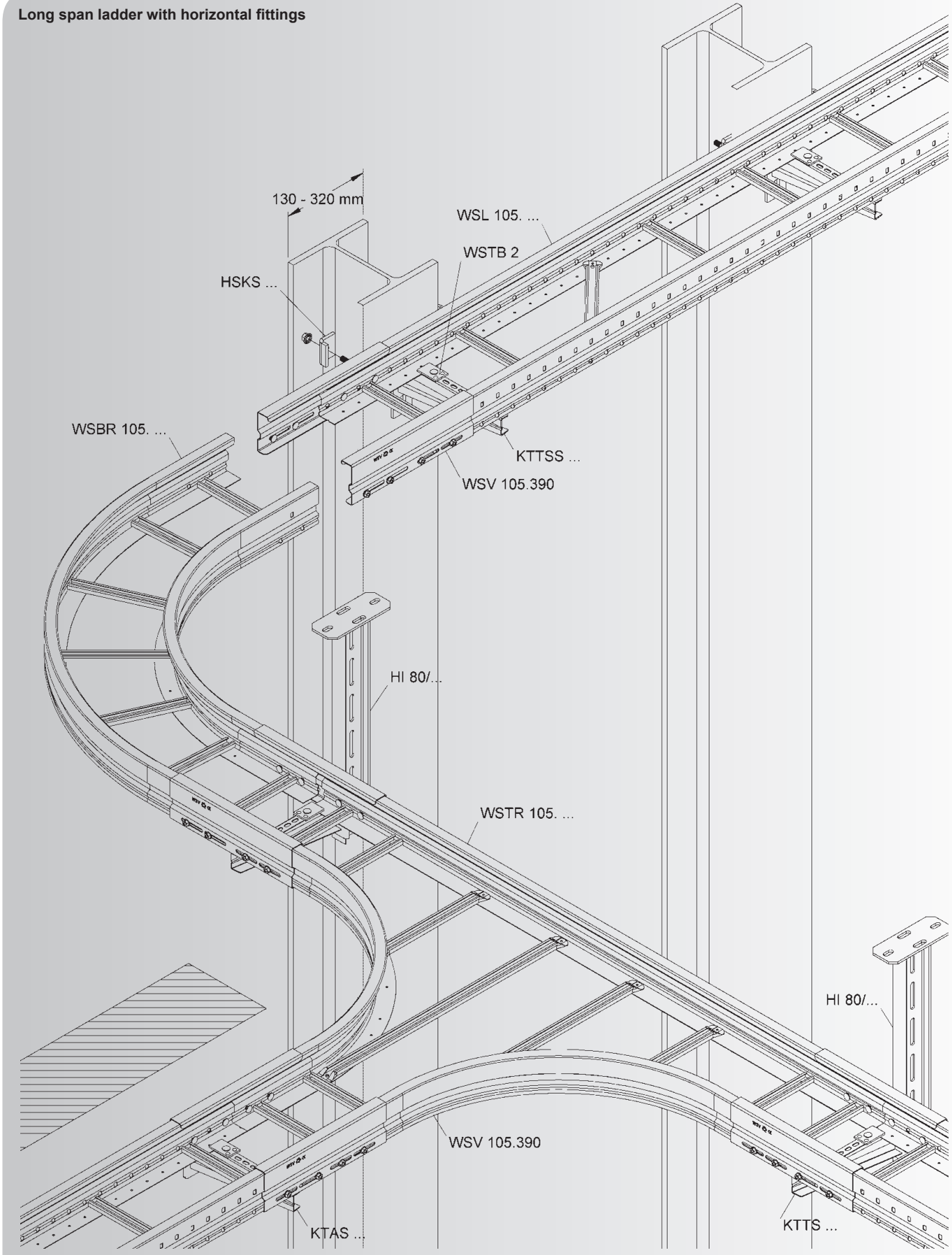


How to Install Skirting Penels to RDB 85... Floorstands

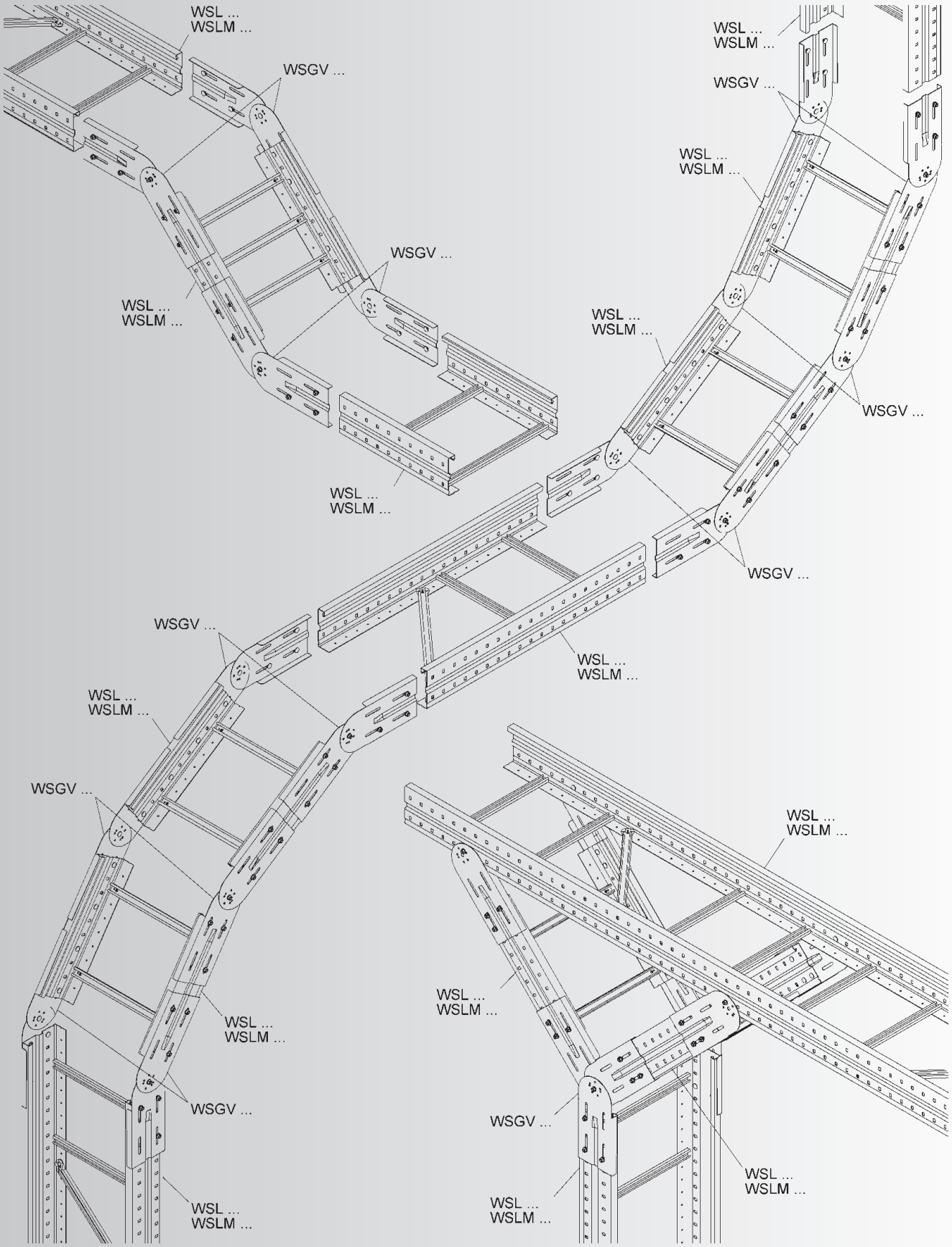


Installation Instructions

Long span ladder with horizontal fittings

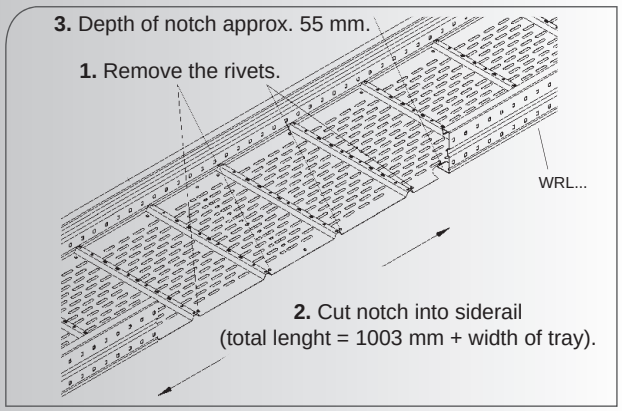


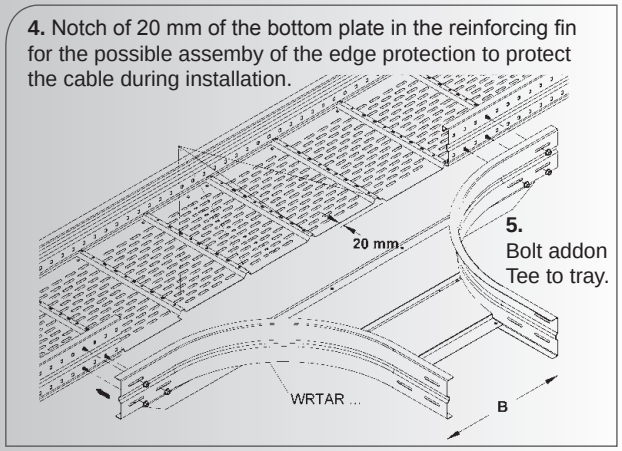
Long span ladder with vertical fittings

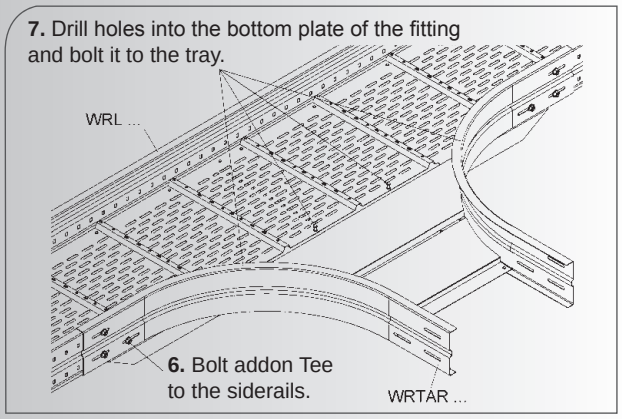


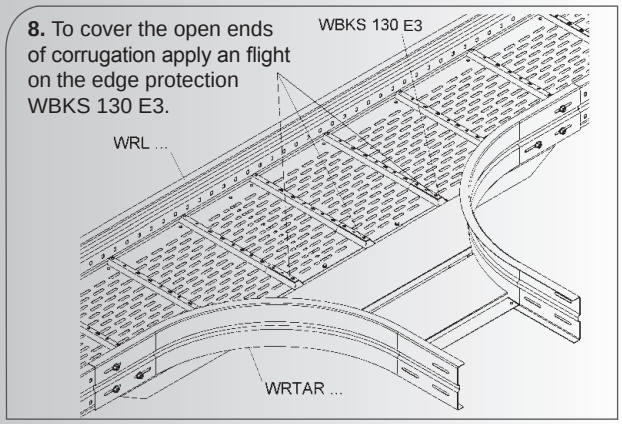
Installation Instructions

WRTAR...

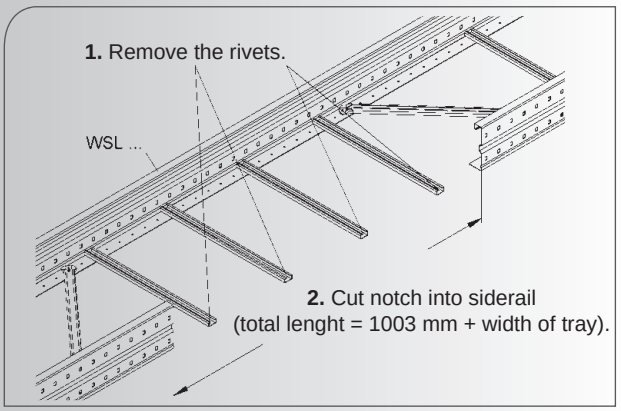


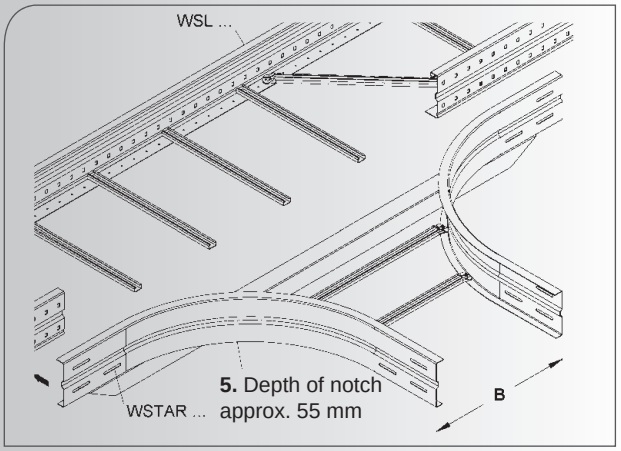


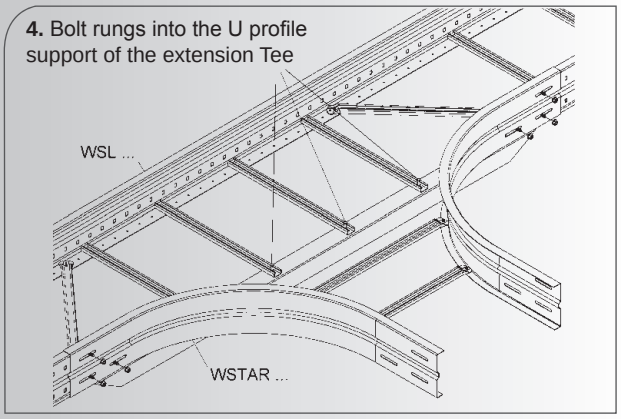


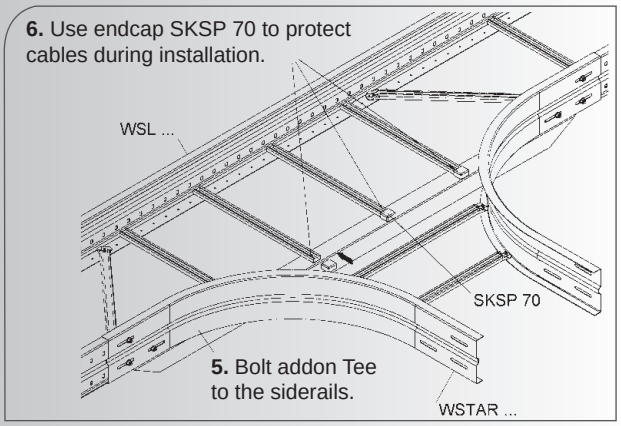


WSTAR...





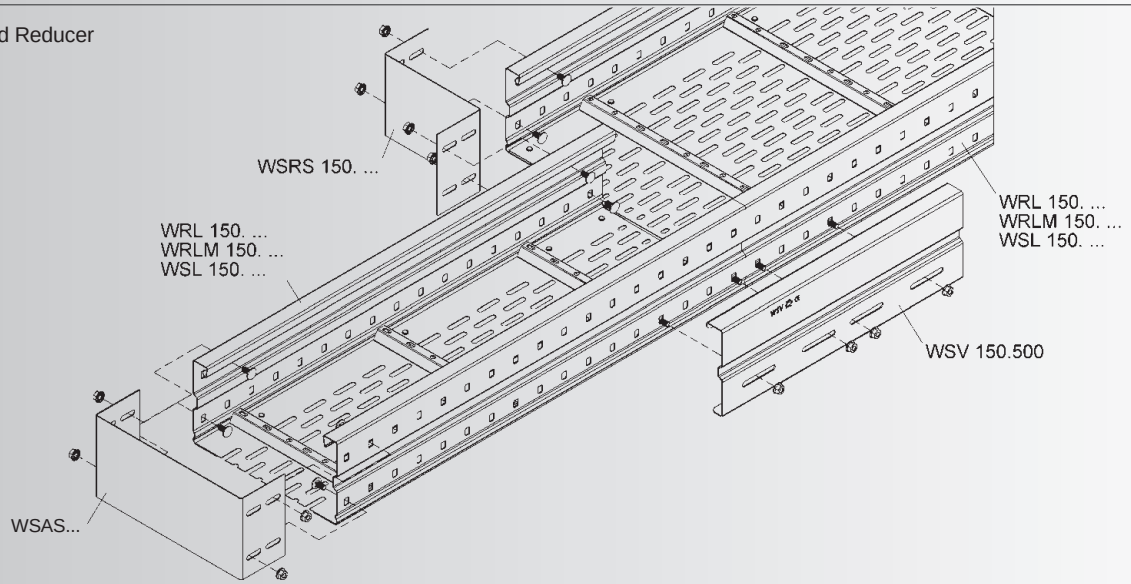




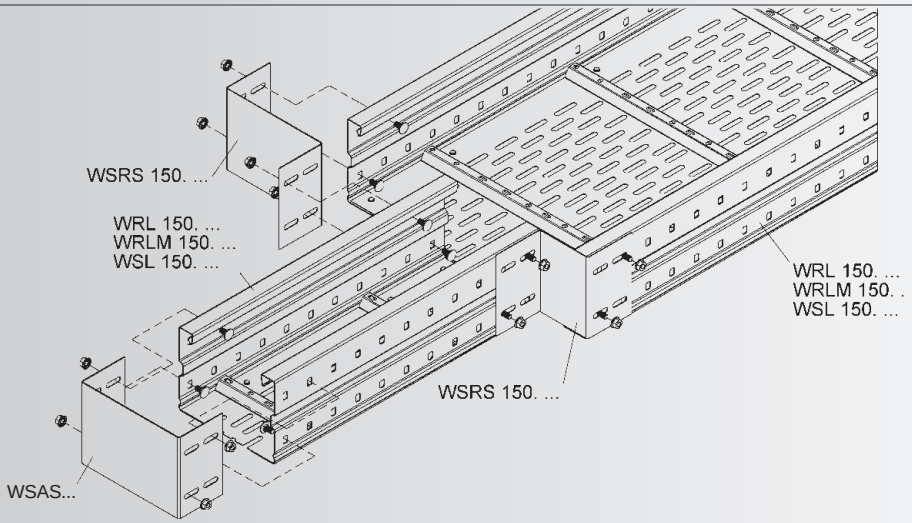
Installation Instructions

How to Build Long Span Reducers

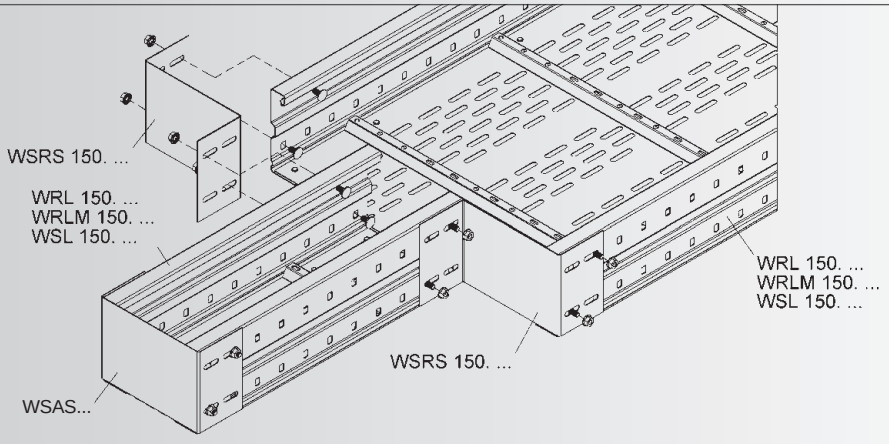
Single Sided Reducer



Asymmetrical Reducer

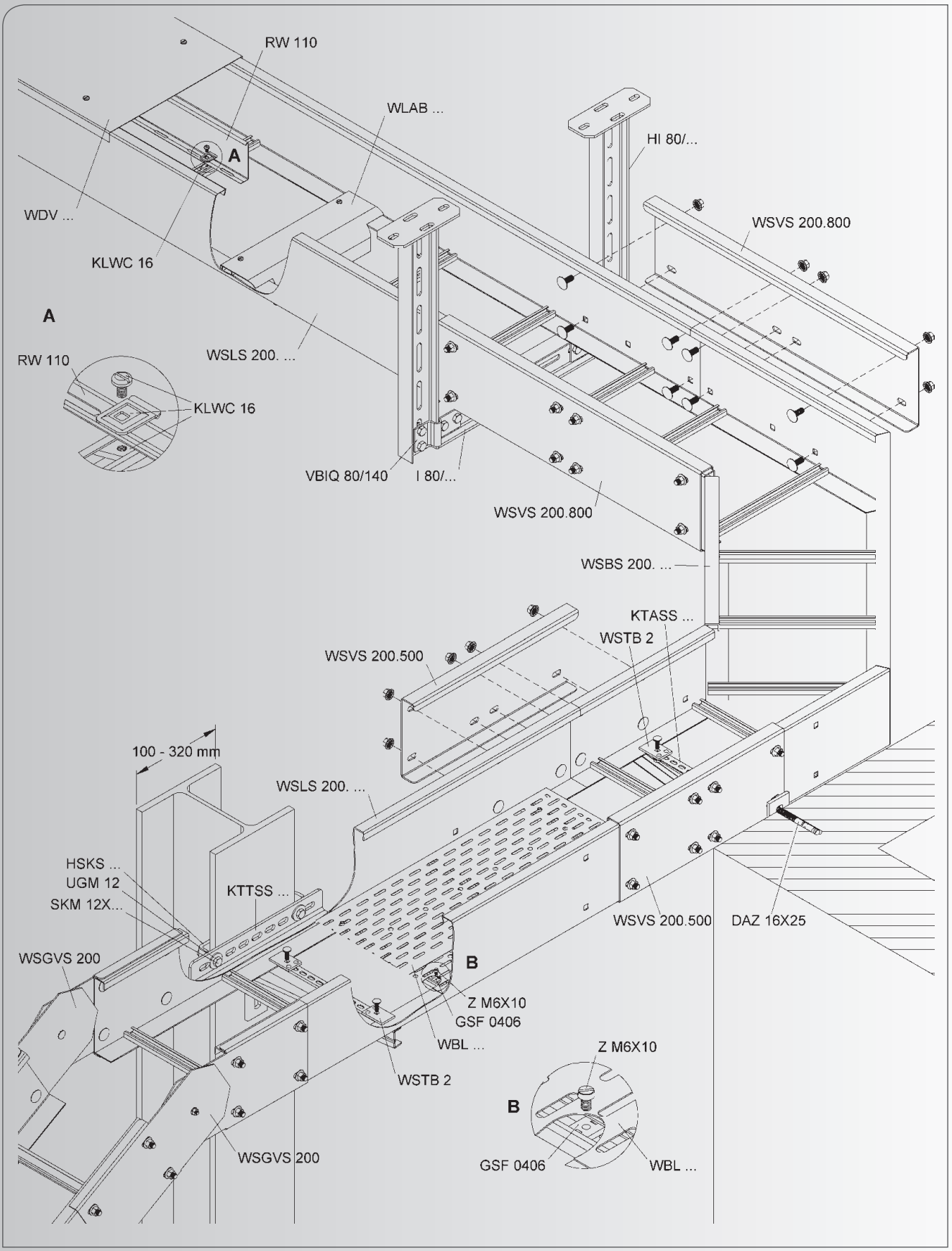


Symmetrical Reducer



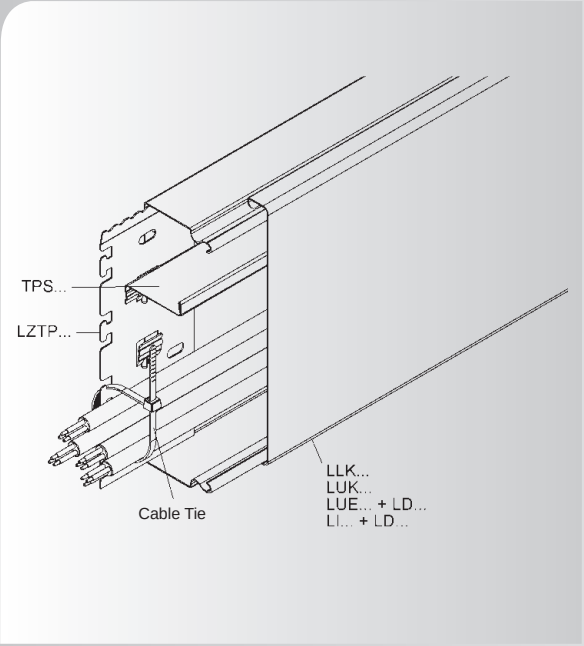
Installation Instructions

Long Span Cable Ladder

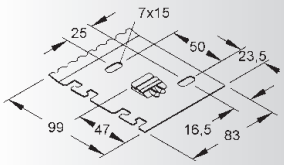


Installation Instructions

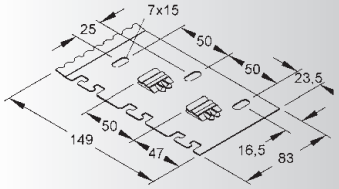
Installation of Divider using LZTP... mounting plate



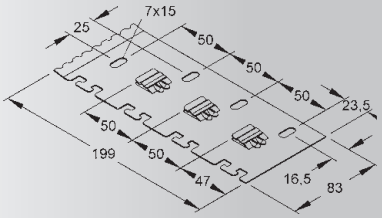
LZTP 100



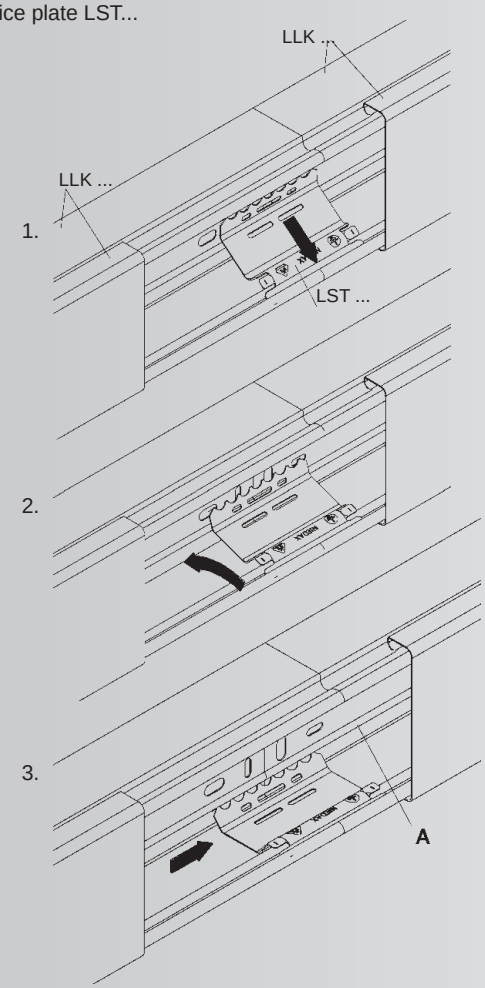
LZTP 150



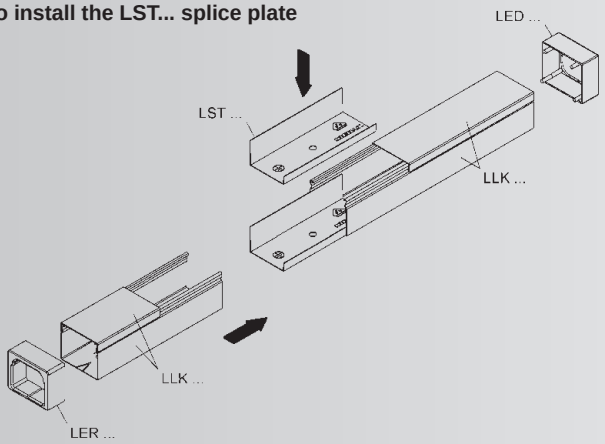
LZTP 200



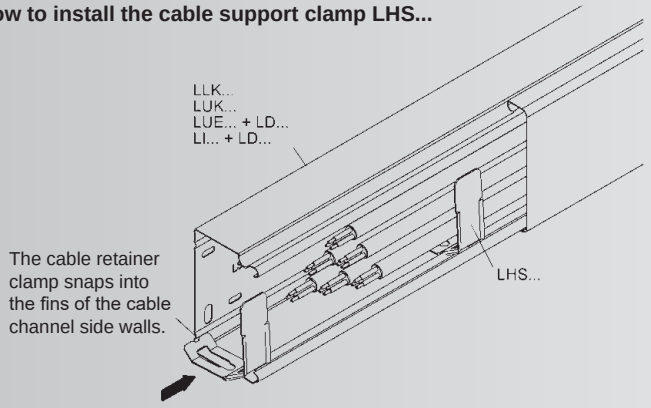
How to install channel cable tray LLK... and LUK...
with splice plate LST...



How to install the LST... splice plate



How to install the cable support clamp LHS...



The cable retainer clamp snaps into the fins of the cable channel side walls.