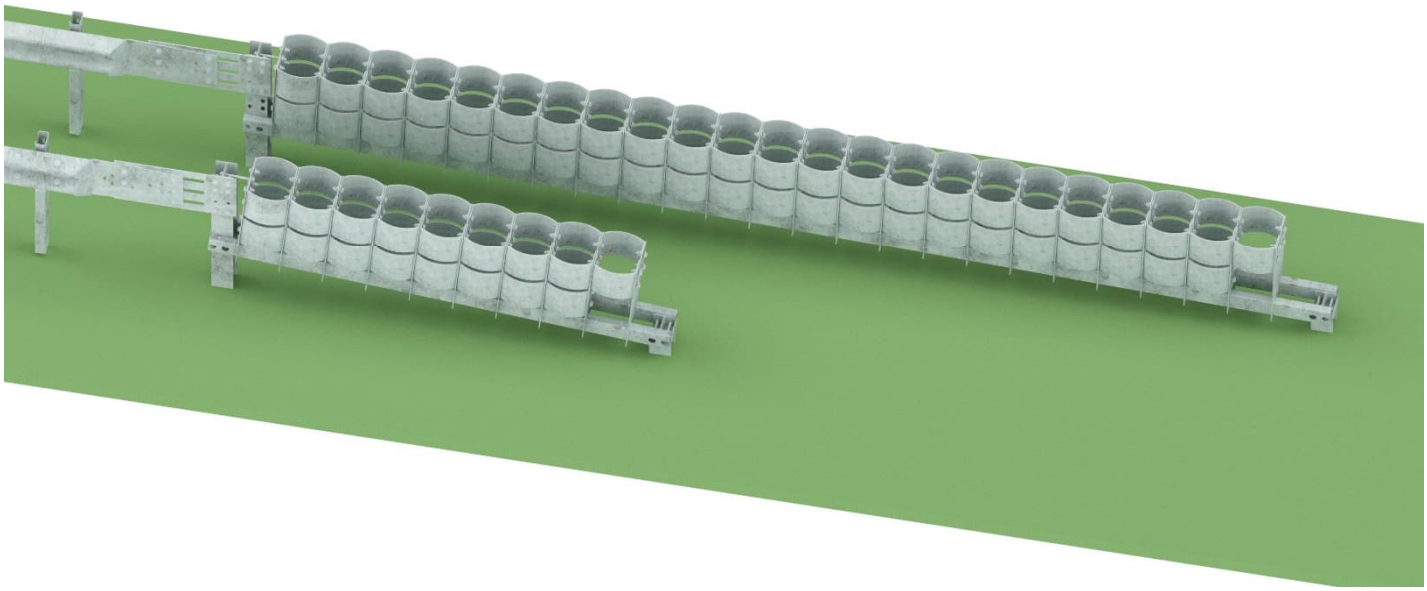
voestalpine Krems Finaltechnik GmbH

# INSTALLATION INSTRUCTIONS

## KREMSBARRIER TERMINAL P4
## KREMSBARRIER TERMINAL P2



Performance class according to ENV 1317-4:

| | |
|---|---|
| Performance class: | P4 / P2 |
| Impact severity class: | B |
| Redirection zone class: | Z2 |
| Permanent lateral deflection: | x1/y1 |

Production and sale:
voestalpine Krems Finaltechnik GmbH
Schmidhüttenstraße 5, 3500 Krems, Austria
T.: +43/50304/14-670
F.: +43/50304/54-628
Email: info.finaltechnik@voestalpine.com

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Annex 5.....Parts list Kremsbarrier Terminal P2



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## SAFETY INSTRUCTIONS

Because work on vehicle restraint systems must be classified as highly dangerous, it may only be carried out under supervision and in accordance with the instructions of properly trained specialists.

The use of these installation instructions presupposes supervision and instruction by these specialists.

Installation personnel must wear personal protective equipment (PPE) in accordance with EU Directive 89/686/EEC and national regulations.

## INTENDED USE

The purpose of the terminal is to stop or redirect vehicles that have veered off the roadway, thus minimizing the consequences for passengers.

*Please note:* *As a rule, vehicle restraint systems should only be required where a vehicle veering off the roadway would have more adverse consequences for the vehicle and the passengers in it, as well as other persons or objects worthy of protection, than driving into the restraint system.*

## TECHNICAL DESCRIPTION OF THE VEHICLE RESTRAINT SYSTEM

| | |
|---|---|
| **Performance parameters according to ÖNORM ENV 1317-4** | |
| Performance class | P4 / P2 |
| Impact severity level | B |
| Redirection zone class | Z2 |
| Permanent lateral deflection | x1/y1 |
| **System dimensions** | |
| System width | 315 mm |
| System length | 6538 mm / 3088mm |
| System height | 820 mm |

## TRANSPORT

When transporting the components of the vehicle restraint system, the following factors must be observed:

- The load must be properly secured.
- On roads covered with de-icing salt, the components must only be transported in tarpaulin-enclosed trucks.
- Avoid contact with other aggressive transport loads (e.g. chemical residues on the loading area).
- Hoists must be dimensioned for a maximum bale weight of 2.5 tons.

*Please note:* *You must also ensure that the load is properly secured when transporting tools for the installation of the vehicle restraint system.*

## INSTALLATION REQUIREMENTS

The contractor (= installation company) must have the professional competence and general qualifications to carry out installation work of this type.

The installation company must have the technical equipment to perform installation work professionally and properly. In addition to the fleet of vehicles required for this work, this includes pile driving devices designed for the necessary length of posts with driving heads and guides adapted accordingly, as well as drilling rigs, impact hammers, pilot shafts, measuring instruments, etc.

The installation company must ensure compliance with all national and international laws, guidelines, regulations, etc., that are applicable to the installation work and must check that the necessary permits have been issued in good time.

Before installation begins, the installation company must

- find out whether there are no existing installations in the anchoring area, and if so take these into consideration accordingly.
- check the suitability of the substrate (soil class, sufficient depth for drilling, evenness, etc.).
- draw the reference line guiding the installation of the vehicle restraint system.
- check that deliveries of material are complete and accurate, and notify the supplier immediately of any complaints.
- ensure that the construction site is proper secured.

When deviations are detected, the client must be notified immediately in writing and their cause must be clarified.

If the components of the vehicle restraint system need to be stored for a short period, the following storage conditions must be observed:

- The storage area must be supportive, reinforced and accessible by truck.
- Galvanized components must not be stored in tall, damp grass, in puddles or mud.
- The bales in the delivered packaging unit must be stored on wooden underlays at a height of at least 150 mm off the ground.
- Components must be stored with a slight gradient so that water can drain away.
- Accumulation of moisture must be avoided.
- Remove the sheets used to prevent shifting during transport.
- The storage area must not be treated with de-icing agents.

The extended storage of bundled components outdoors must be avoided.

## SUITABLE SUBSTRATE

The substrate is suitable for installation if the following conditions are met:

- Soil classes 3, 4 and 5 according to ÖNORM B 2205 and loose soils that can be classified in these soil classes
- Degree of compaction $D_{pr} \geq 97\%$
- The installation substrate can be pile driven.

The subsoil can be considered suitable for driving in piles for installing a vehicle restraint system if it can be classified in the soil classes 1,3,4 and 5 according to ÖNORM B 2205, does not contain any boulders, and has a low stone proportion of < 10 mass-% according to ČSN EN ISO 14688-2.

# INSTALLING THE TERMINAL IN ACCORDANCE WITH THE DATA SHEETS (SEE ANNEX)

The pre-assembly of the terminal components at the factory is possible, but not essential. The vehicle restraint system is not pre-stressed, so the ambient temperature is not relevant for installation.

## 1. Marking off the location of the terminal

The leading edge of the terminal must always be aligned with the leading edge of the restraint system. The axis of the terminal is therefore parallel 158 mm behind the leading edge of the restraint system.

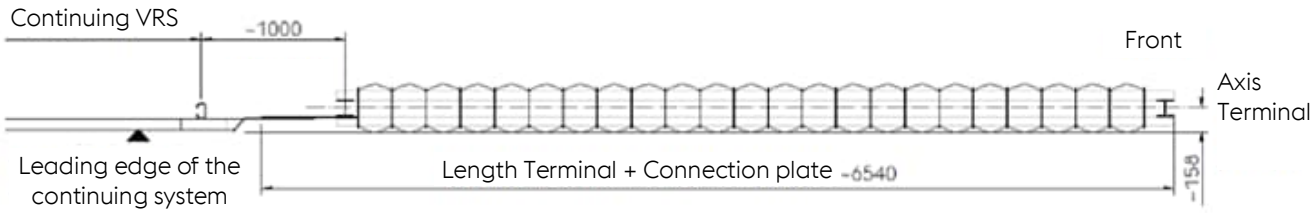


Figure 1: Location of the P4 Terminal

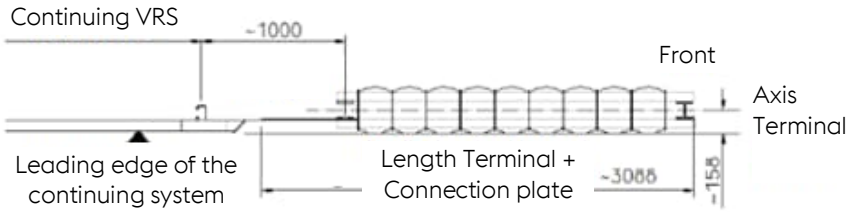


Figure 2: Location of the P2 Terminal

*Please note:* *The distance of approximately 1000 mm between the axis of the back I120 post and the 1st post of the continuing restraint system may vary. You can find more detailed information about the connection to the guardrail cross-sections in the appendices.*

## 2. (Pre)installation of the terminal

### 2.1. Location of the “Terminal guide rails”

The “Terminal guide rails” must be mirror-inlaid so that the small Ø18 mm diameter holes are on the inside and the larger Ø 42 mm diameter holes are on the outside.



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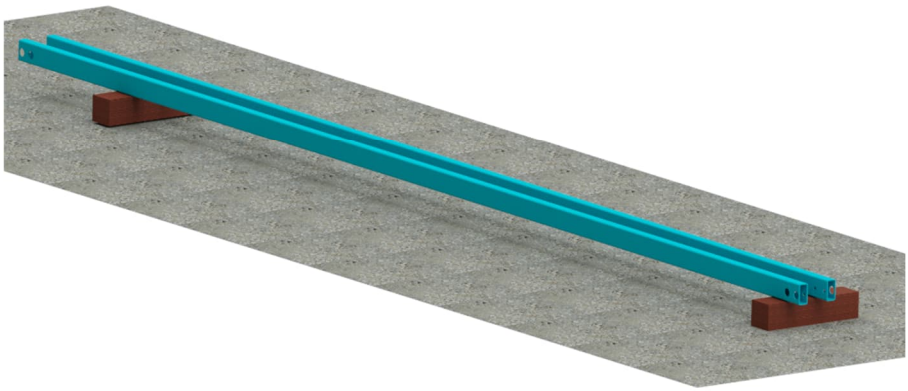

Figure 3: Terminal guide rails in position

*Please note:*

*In order for the "Terminal guide plates" to slide smoothly in, the "Terminal guide rails" must be placed, for example, on squared timber to ensure clearance above the roadway for further preinstallation.*

## 2.2. Inserting the "terminal guide plates"

Now slide onto the already installed "Terminal guide profiles" the following:

- 24 "Terminal guide plates" for the P4 version
- 10 "Terminal guide plates" for the P2 version

To accomplish this, the two 57x105 mm rectangular holes in the guide plates are slid through the guide rails.

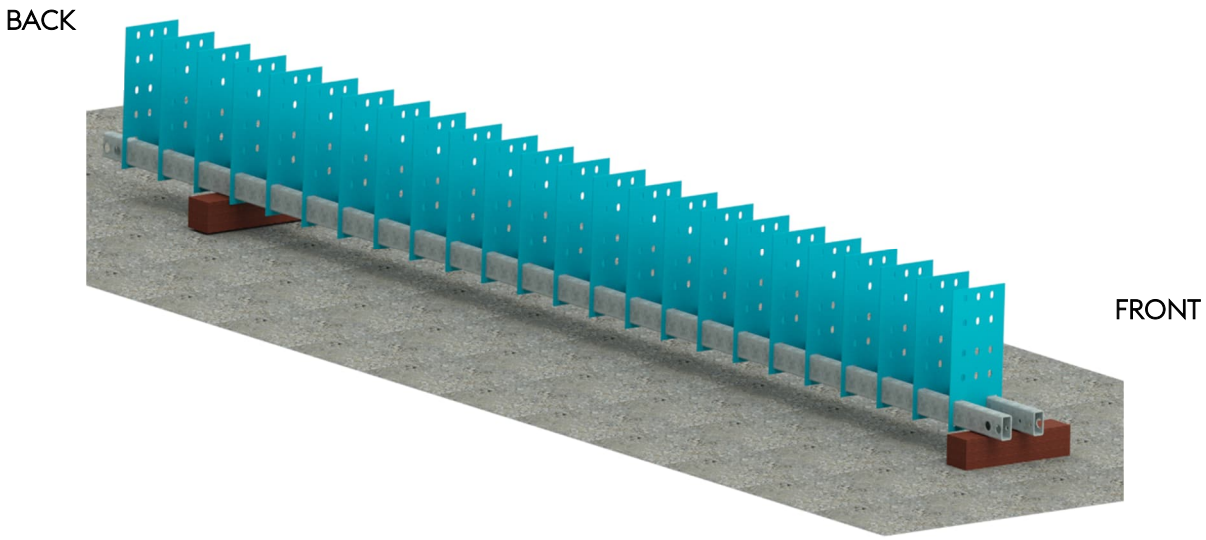


Figure 4: inserted guide plates of the terminal on the example of the P4 version



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### 2.3. Installing the absorbing elements “absorber half-shells.S1” in segment 1

Two “absorber half-shells.S1” are affixed to the front between the 1st and 2nd “terminal guide plate“ (segment 1).

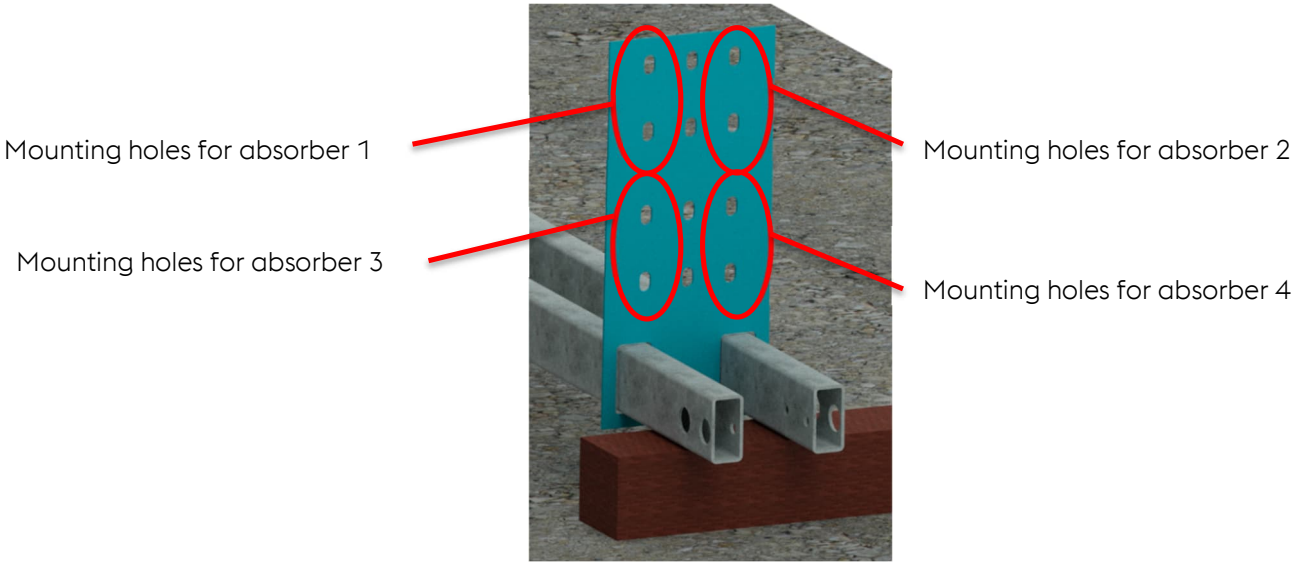


Figure 5: Mounting holes for absorbers half-shells

To accomplish this, one M16x50 FK8.8 hexagon bolt with a 40x18x4 washer is inserted from the front through the mounting holes for absorber half-shell 1 (see Figure 5) of the “terminal guide plates” as well as through the 18 mm diameter holes of absorber half-shell.S1 and affixed always with one 40x18x4 washer and M16 FK 8 hexagon nut. The arch of the absorber half-shell must face outwards and the absorber half-shell S1 must be aligned with the upper edge of the guide plate.

The installation of the second “absorber half-shell.S1” is done the same way in mirror arrangement using the mounting holes for absorber half-shell 2 (see Figure 6).

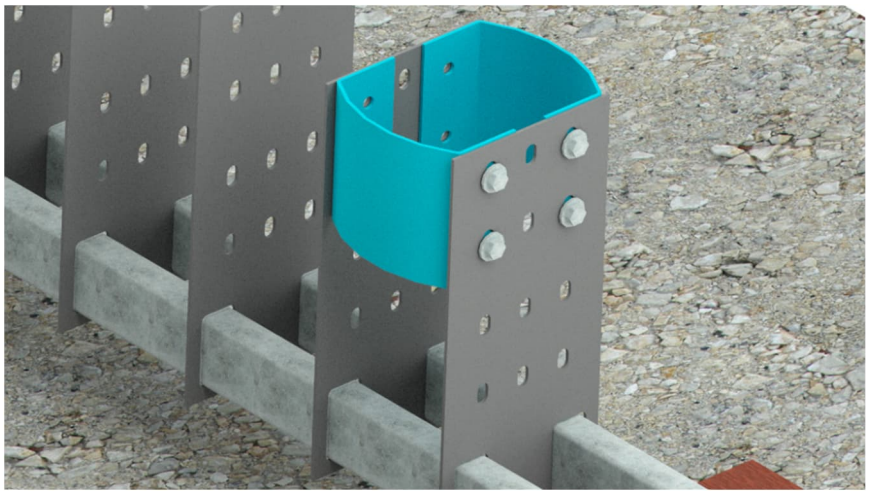

Figure 6: Installation of “absorber half-shell.S1” in the 1st segment

### 2.4. Installing the absorbing elements “absorber half-shells.S1” in segment 2

Four “absorber half-shells.S1” are affixed between the 2nd and 3rd “terminal guide plates” (segment 2).

To accomplish this, one M16x50 FK8.8 hexagon bolt with a 40x18x4 washer is inserted from the front through the mounting holes for absorber half-shell 3 (see Figure 5) of the “terminal guide plates” as well as through the 18 mm diameter holes of absorber half-shell.S1 and affixed always with one 40x18x4 washer and M16 FK 8 hexagon nut. The arch of the absorber half-shell must face outwards.

The second absorber half-shell is installed the same way using the mounting holes for absorber half-shell 4.

Then insert the M16x50 FK 8.8 hexagon bolts already fitted with 40x18x4 washers through the remaining 18 mm diameter holes of the absorber half-shell in segment 1, then through the elongated S1 mm hole located at the same height in the “terminal guide plate” and through the holes Ø18 mm diameter holes of the absorber half-shell S1 in segment 2 and affix them as always with one washer 40x18x4 and M16 FK 8 hexagon nut. The same applies to the mounting holes for absorber half-shells 1 and 2 (see figures 5 and 7).

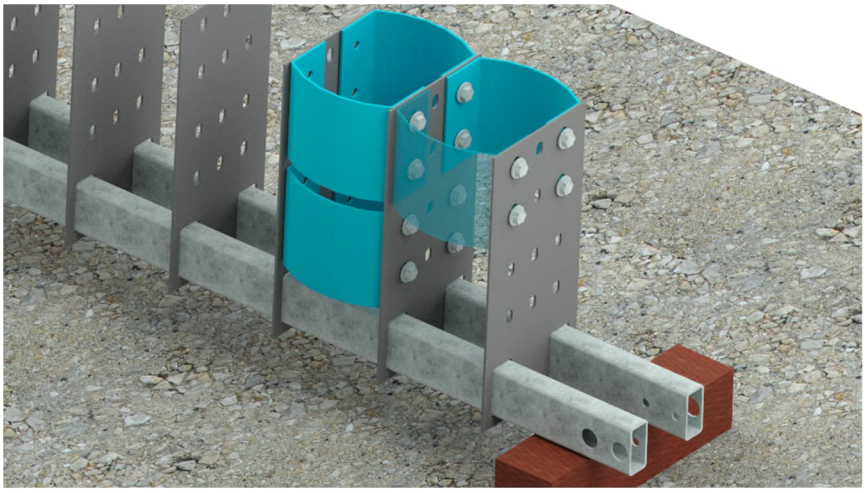

Figure 7: Installation of “absorber half-shell.S1” in the 2nd segment

### 2.5. Installing the absorbing elements “absorber half-shells.S1” in from segment 3 to the last segment

Between the

- 3. and 23. "Terminal guide plate" for the P4 version

respectively between the

- 3. and 9. “Terminal guide plate" for the P2 version

always 4 "damping half-shells.S1 are assembled. From segment 3 on, the “absorber half-shells.S1“ of two segments are connected to each other by two hexagon bolts.

To accomplish this, insert the M16x50 FK 8.8 hexagon bolts already fitted with 40x18x4 washers through the remaining 18 mm diameter holes of the absorber half-shell.S1 in the preceding segment, then through the elongated 30x18 mm hole located at the same height in the “terminal guide plate” and through the holes 18

mm diameter holes of the absorber half-shell.S1 in the following segment and affix them as always with one 40x18x40x18 washer and M16 FK 8 hexagon nut. The same applies to the mounting holes for absorber half-shells 1, 2, 3 and 4 (see figures 5 and 7).

*Please note: Unlike all the other guide plates, the screw connection of the last "terminal guide plate" must be made from back to front to prevent the threads of the screws from interfering with the I120 posts (see figure 8)!*

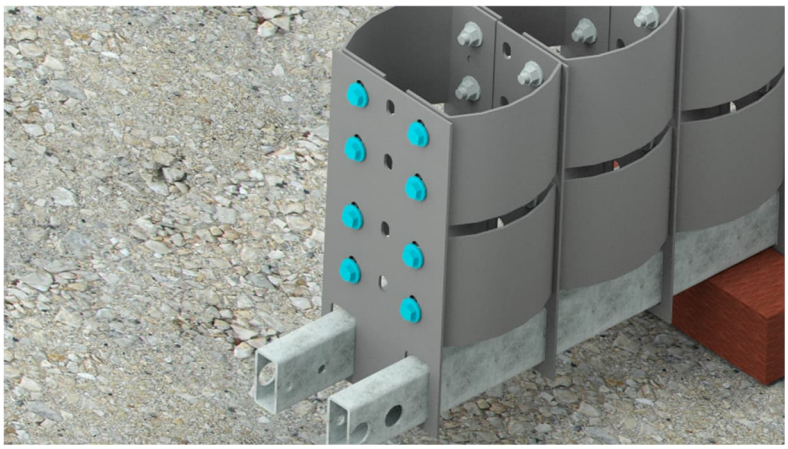

Figure 8: Screw connection of the last guide plate

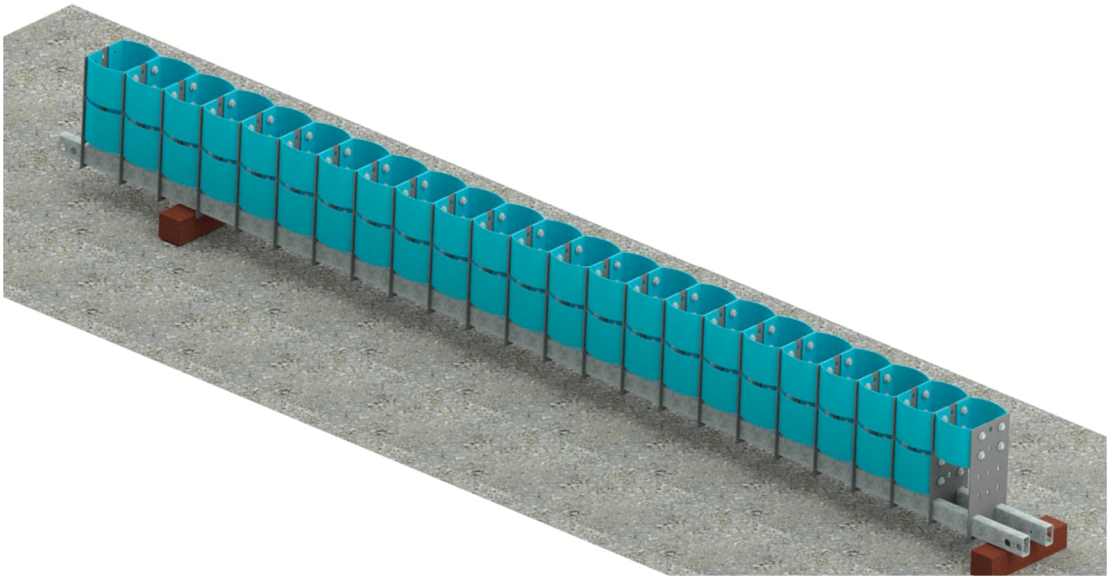

Figure 9: Complete assembly of all the segments on the example of version P4

## 3. Pile-driving both I120-posts 2000 BE

Both I120 posts with a length of 2,000 mm are driven vertically into the subsoil with a suitable ram

- at a distance of 5,880 mm (central axis of the flange) for the P4 version
- at a distance of 2,420 mm (central axis of the flange) for the P2 version

in the middle of the already marked axis so that the upper edge of the front post is $130^{+20}_{-0}$mm above the reference plane and the back post $820^{+20}_{-0}$mm above reference plane (see figure 10 - version P4 or figure 11 - version P2). The I120 posts must be positioned as shown in Figure 10 or 11 so that their flanges are perpendicular to the axis of the terminal. It is necessary to make sure that the 5 rows of elongated 30x20 mm holes on the flange of the I120 post are at the upper end of the post (head) and on the side facing traffic. When correctly placed, the sheet metal welded between the flanges points towards the "front".

The pile driver must be equipped with an extension suitable for the I120 cross-section in order to prevent deformation or damage to the hot-dip galvanized head of the post. The guide mounted on the pile driver near the upper edge of the railing and adapted to the I120 cross-section ensures the precise positioning of the post during the pile driving.

Given the low upper edge of the $130^{+20}_{-0}$ mm post above the reference plane, a suitable pile driver extension is usually required for the front I-post.

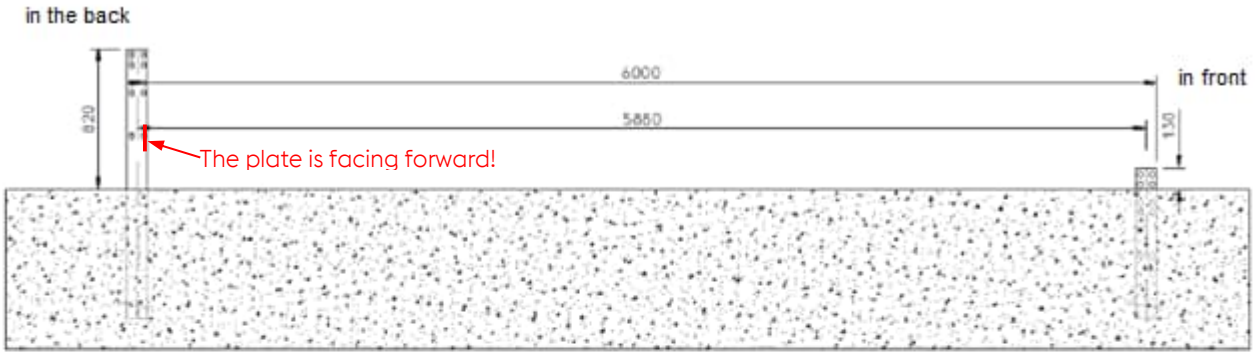


Figure 10: Version P4, post placement I120

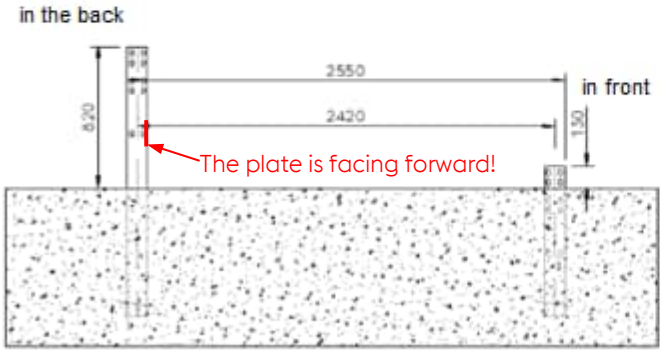


Figure 11: Version P2, post placement I120



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*Now place the pre-assembled terminal in the correct position (Caution: Use wooden supports!) To accomplish this, the elongated holes in the flange of the I120 posts must be vertically aligned with the respective opposite Ø42 mm diameter and Ø18 mm diameter holes of the "terminal guide rails" (see Figures 12, 13, 14 and 15).*

*The "terminal guide rails" must also be precisely aligned longitudinally. This is the only way to ensure that the hammered posts can be screwed to the shaped pipes (see Chapter 4).*

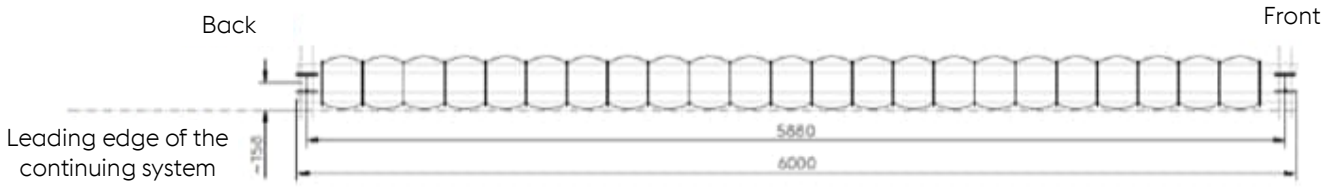


Figure 12: Location of the I120 posts with the pre-assembled Terminal P4

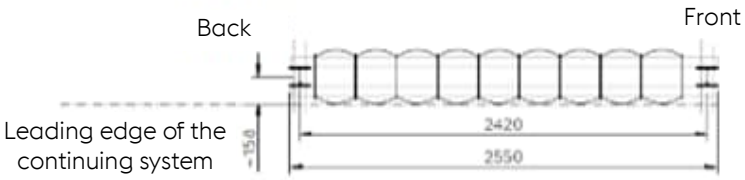


Figure 13: Location of the I120 posts with the pre-assembled Terminal P2

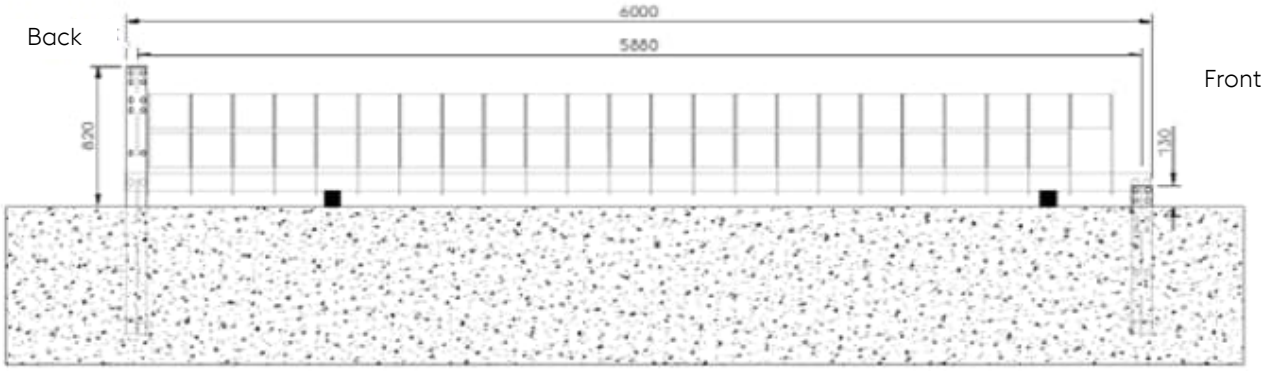


Figure 14: Location of the I120 posts with the pre-assembled Terminal P4 already aligned

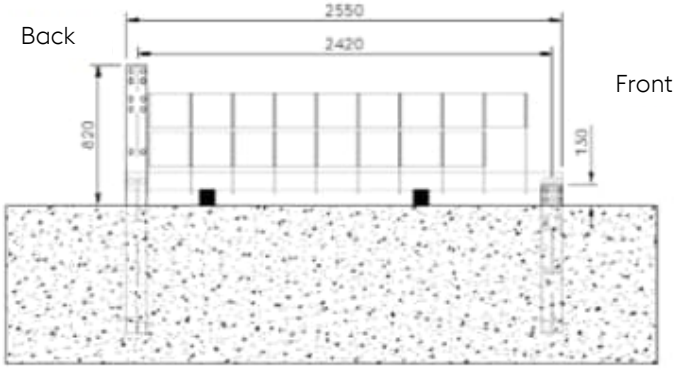


Figure 15: Location of the I120 posts with the pre-assembled Terminal P2 already aligned



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## 4. Creating a screw connection between the rails and I120 posts

The legs of the “terminal U-bracket” are inserted into the hollow ends of the “Terminal guide rails” so that both Ø20 mm diameter holes of the “Terminal U-bracket” cover the two Ø18 mm diameter holes of the “Terminal guide rails”.

*ATTENTION:*
*If the optional "Terminal ramp" is installed, it is first pre-assembled and screwed to the "Terminal U-bracket". To accomplish this, an M16x50 FK 8.8 hexagon bolt with a 40x18x4 washer already installed is inserted from the open side of the "Terminal U-bracket" through the Ø20 mm holes in the “Terminal U-bracket”- bridge plate and through the Ø20 mm holes in the "Terminal ramp" and are each fixed with one 40x18x4 washer and one M16 FK 8 hex nut (see figure 17 and 18) so that the edge of the "Terminal ramp" runs parallel to the bridge plate of the “Terminal U-bracket" (see Fig. 17 and 18).*

Then the "Terminal guide rails" with the installed "Terminal U-bracket" and optionally installed "Terminal ramp" are raised to the height of the 1st row of longitudinal holes 30x20 mm (upper row of longitudinal holes) of the front I120-post and screwed in place. For this purpose, both M16x160 FK 8.8 hexagon bolts with an already fitted 40x18x4 washer are inserted through the opposite Ø20 mm holes in the U-bracket of the Terminal, the Ø18 mm holes in the “Terminal guide rail” and the longitudinal 30x20 mm hole on the I120 post and fixed each with one 40x18x4 washer and an M16 FK 8 hex bolt (see figure 16).

The "Terminal guides" with the "Terminal U-bracket" in place are raised to the height of the 5th row of the 30x20 mm longitudinal holes (the lowest row of longitudinal holes - height ~506mm below the upper edge of the post) of the I120-rear_post and screwed in place. For this purpose, the two M16x160 FK 8.8 hex screws with the 40x18x4 washer already installed are inserted through the opposite Ø20 mm holes in the “Terminal U-bracket”, the Ø18 mm holes in the “Terminal guide rail” and the longitudinal hole 30x20 mm on the I120 post and fixed each with one 40x18x4 washer and an M16 FK 8 hex bolt (see figure 19).

Ensure the different direction of insertion of the two M16x160 FK 8.8 hexagon bolts so that the head of one bolt is on the side facing the road and the other bolt head is on the side facing away from the road.

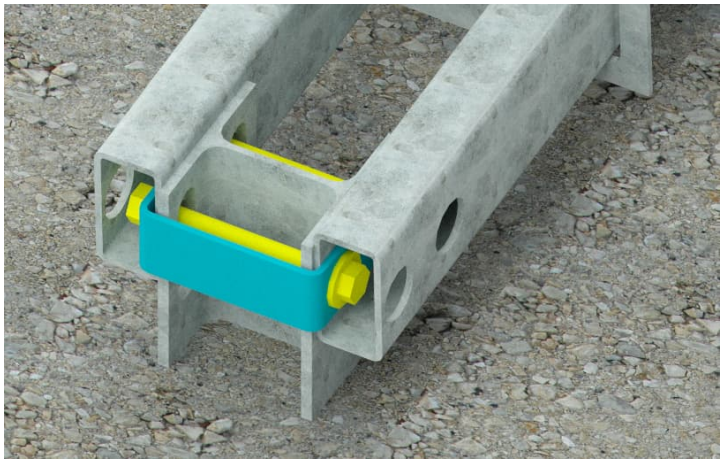

Figure 16:
Mounting on the I120 front post without a ramp

Figure 17:
Mounting to a I120 front post with a ramp



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Figure 18:
Mounting to a I120 front post with a ramp

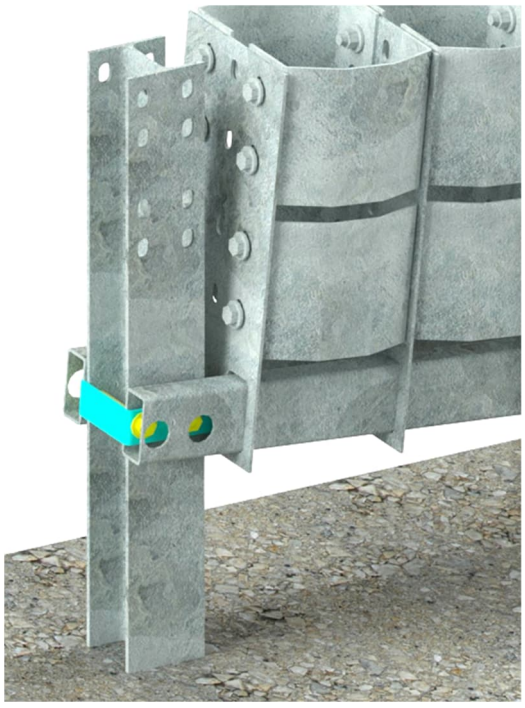

Figure 19:
Mounting to a I120 back post

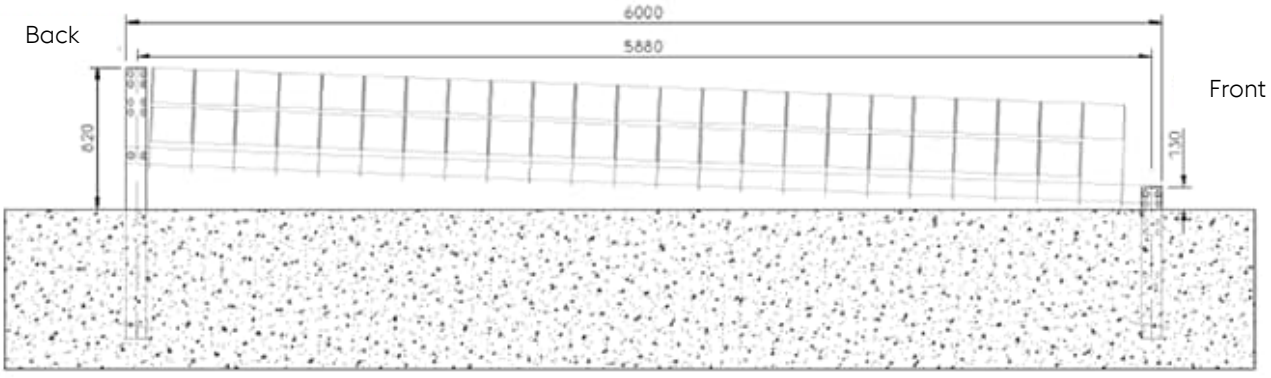


Figure 20: Completed assembly of the pre-assembled Terminal P4 with both I120-posts

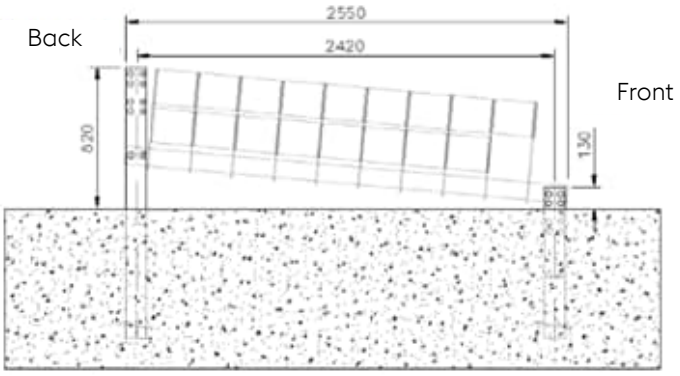


Figure 21: Completed assembly of the pre-assembled Terminal P2 with both I120-posts



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## 5. Fixing the last “Terminal guide plate” to the back I120-post

The last “Terminal guide plate” is connected to the back I120-post with two hex bolts M16x160 FK 8.8.

To accomplish this, two hex bolts M16x160 FK 8.8 already fitted with a washer 40x18x4 are inserted through the middle elongated holes 18x30 at the upper and lower ends of the last “Terminal guide plate” and through the 20 mm diameter holes behind it in the web plate of the I120 post and affixed always with one washer 40x18x4 and one hexagon nut M16 F8 (see Figure 22).

Figure 22: Hexagon bolts mounting

*Please note:* *Fixing the guide plate to the I-post must be so tight that it is impossible to loosen the screw connection by hand. The guide plate does not need to touch the I-post.*

## 6. Installing the “VRS terminal connection”

The “VRS terminal connection” component must now be connected to the back I120-post. To accomplish this, the “VRS terminal connection” is placed on the I120 post so that the Ø20 mm diameter holes in rows 1,2 and 4 cover the Ø20 mm elongated holes of the 30x20 post flange behind them facing the road. The “VRS terminal connection“ should be flush with the upper edge of the I120 post.

Subsequently one M16x50 FK 8.8 hexagon bolt fitted with a 40x18x4 washer is inserted through each of the 20 mm diameter holes in the “terminal connection” rows 1,2 and 4 and through the elongated holes 30x20 behind it in the flange of the I120 post and affixed with one washer 40x18x4 and M16 FK8 hexagon nut (see Figure 23).

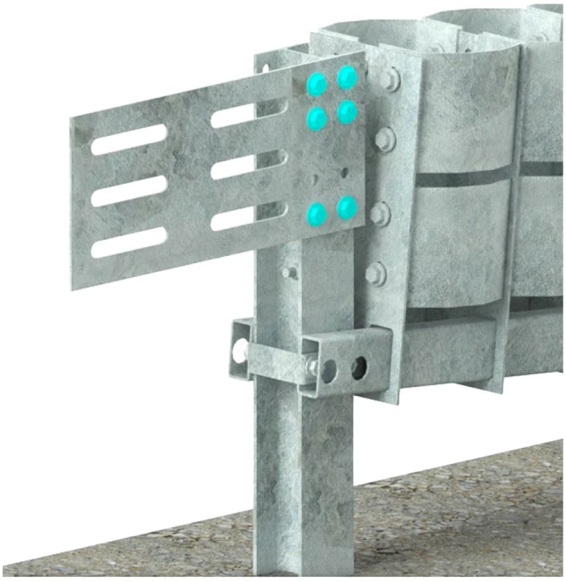

Figure 23: Installing the “VRS terminal connection”

## 7. Creating a connection to the continuing restraint system.

A transition guard rail, e.g. LS.S2A> Rebloc RB80, is connected to the “VRS terminal connection”. The crosssection of the S2A guard rail can be continued in this way. Alternative transition guard rails for S1 and S3 guard rails are also available. The location of the transition guard rail is then always done on top of the “VRS terminal connection”, i.e. on the side facing the road (see Figure 24 and Figure 25).

To accomplish this, six M16x50 FK 8.8 hexagon bolts fitted with 40x18x4 washers are inserted through four 18 mm diameter holes and two vertical elongated holes of the transition guard rail connection plate and through the elongated holes of the “VRS terminal connection”. An 11mm spacer, 20 (60x22x4mm) washer and 40x18x4mm washer are inserted and affixed with an M16 FK8 hexagon nut (see Figure 24 and Figure 25).

To ensure the immediate effect of the tensioning band mechanism, the barrier transition must always be pulled to the stop in the direction of the connection system before establishing its connection (see arrow direction in Figure 24 and Figure 25).

*Please note: Make sure that the 11 mm spacer fits into the elongated holes and that the joint is not pinched!*



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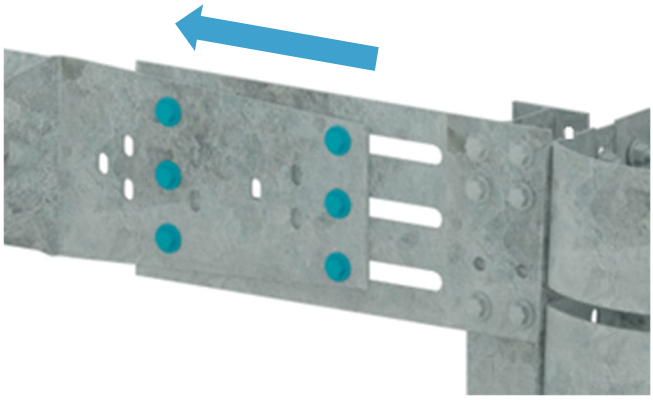


Figure 24: Front view of transition guard rail

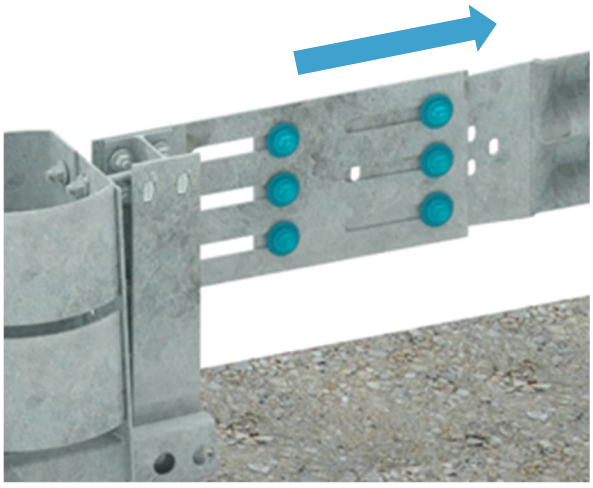


Figure 25: Rear view of transition guard rail

The extended restraint system is connected directly to the respective restraint transition. Information on how to proceed with their installation is available in the respective installation instructions and in the enclosed data sheets.

## 8. Mounting of the optional directional plate

Depending on national requirements, it may be necessary to attach a directional plate to the front "Terminal guide plate " to improve visibility and/or direct traffic. For this purpose, a M16x50 FK 8.8 hex bolt with a 40x18x4 washer already installed is inserted through the Ø18mm hole (drilled on site) in the guide plate and through one of the 30x18mm centered longitudinal holes located behind it in the "Terminal guide plate" and fixed by one 40x18x4 washer and a M16 FK8 hex bolt (see fig. 26 and 27).

The directional plate should be placed on the "Terminal guide rails" so that it is stable in the fixed position. The directional arrows or markings must point in the direction of the correct lane.

Figure 26:
Bolt connection of the directional plate

Figure 27:
Directional plate alignment

## 9. Torques for threaded connections

| Thread / Strength class | Torques | |
|---|---|---|
| | minimum | maximum |
| M16 / 8.8 | 35 Nm | 210 Nm |

*Please note:* *When tightening threaded connections that are not pre-stressed in accordance with the plan in the range of the torques given above, make sure that everything is even as much as possible at the tightening point.*

## 10. Conformity check

The following checks must be performed continuously during installation and the final inspection:

- Proper alignment and bolting of components
- Proper placement of the spacers to avoid pinching the guard rails.
- Proper overlap of components
- Symmetrical alignment of components
- In order to ensure the effect of the tensioning strip, the barrier transition must always be tightened to the stop in the direction of the connection system.

Appropriate corrective measures must be taken in the event of deviations outside the permitted tolerances.

Once the installation activities are complete, an inspection must be performed during handover to ensure that the installation was done correctly in accordance with the installation instructions and documented in the acceptance protocol.

## 11. Cleaning on the construction site

Dispose of all residual material (including fasteners), packing material such as wooden underlays, screw boxes, sheets, packing straps, etc. and other waste.

Leave the construction site only after sweeping it.

## REPAIR OF THE VEHICLE RESTRAINT SYSTEM

All components that show mechanical damage or deformation after an accident must be replaced with new components. Follow the installation instructions when assembling these parts.

In general, new fasteners must be used when repairing a vehicle restraint system.

## DURABILITY OF CORROSION PROTECTION

To ensure the service life / protection period, the components of vehicle restraint systems are hot-dip galvanized in accordance with EN ISO 1461.

The protection period for zinc coatings is defined in EN ISO 14713 and depends mainly on the thickness of the coating. It can generally be assumed that the zinc wears off in layers. Based on the macroclimatic corrosion of category C4 known to exist on roads, zinc can be expected to erode at a rate of 2.1 to 4.2 µm per year. This results in a protection period of at least 15 years for an average zinc thickness of at least 70 µm calculated according to EN ISO 1461.

*Please note:* *The protection period calculated using the above method only applies to macroclimatic corrosion. Microclimatic peculiarities can shorten the protection period.*

## INSPECTION AND MAINTENANCE

Voestalpine Krems Finaltechnik GmbH vehicle restraint systems are basically maintenance-free.

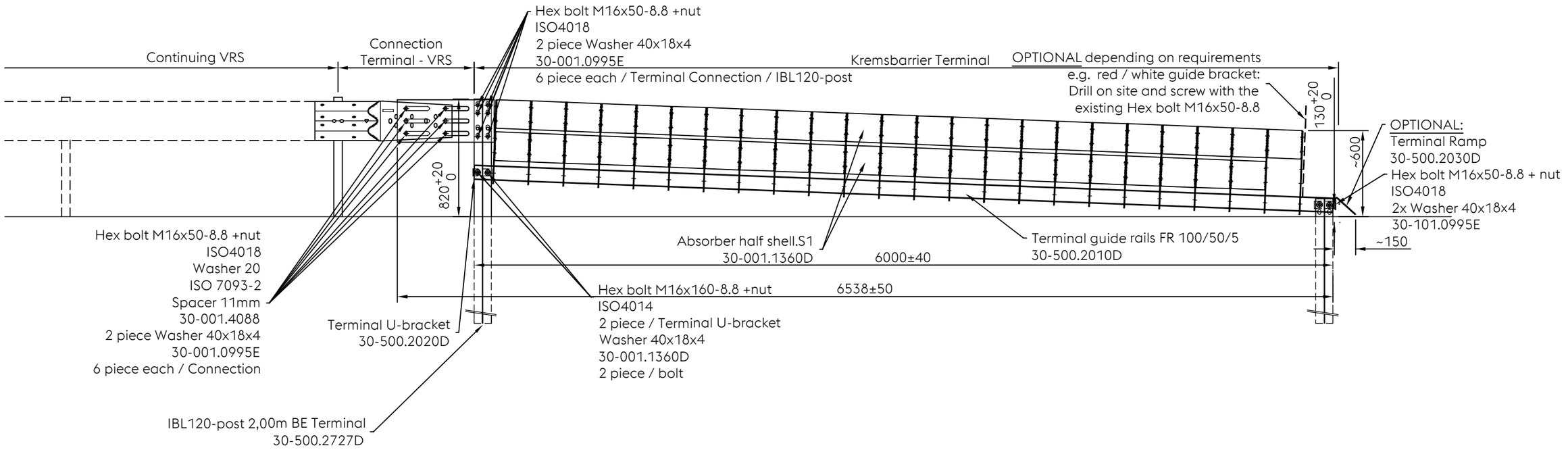
The vehicle restraint system must be visually checked at least once a year, preferably after the winter season, as part of ongoing road maintenance inspections. These inspections should look for deformed components and check that the fasteners are screwed in properly. The rail system must be kept free of dirt and soiling that could negatively impact the proper function of the system.

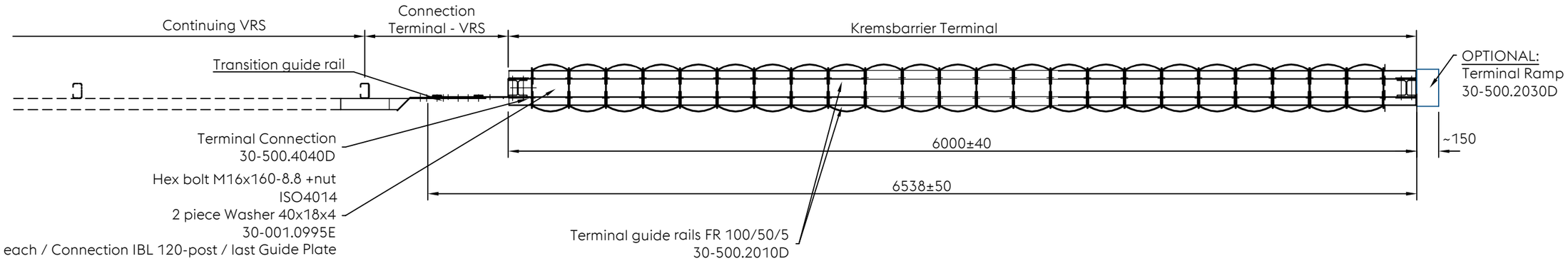
## RECYCLING / DISPOSAL

Dismantled vehicle restraint systems or components replaced when repairs are made should be disposed of in accordance with legal regulations and disposed of in recycled waste. The components of Voestalpine Krems Finaltechnik GmbH vehicle restraint systems are 100% recyclable.

Packaging material and other waste must be recycled or disposed of in accordance with legal regulations.

Toxic or hazardous materials are not used in Voestalpine Krems Finaltechnik GmbH vehicle restraint systems.




## Section: A-A

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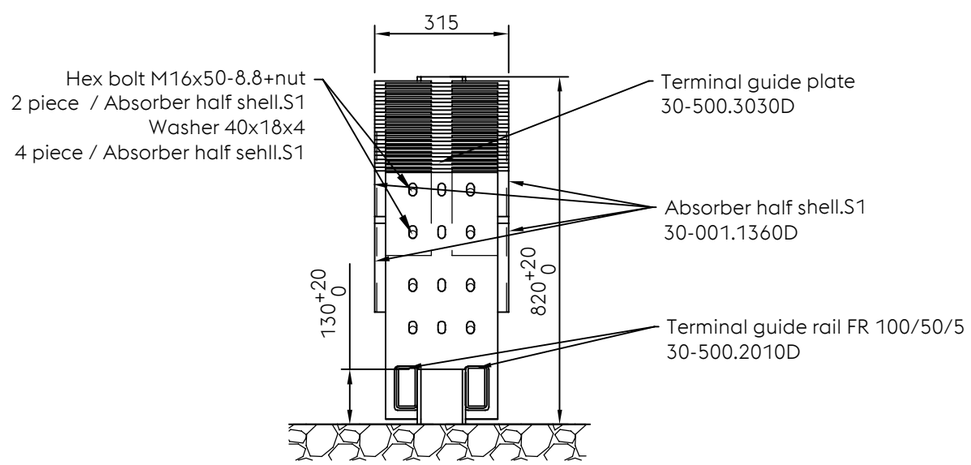


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# KREMSBARRIER TERMINAL P4

Data Sheet T110
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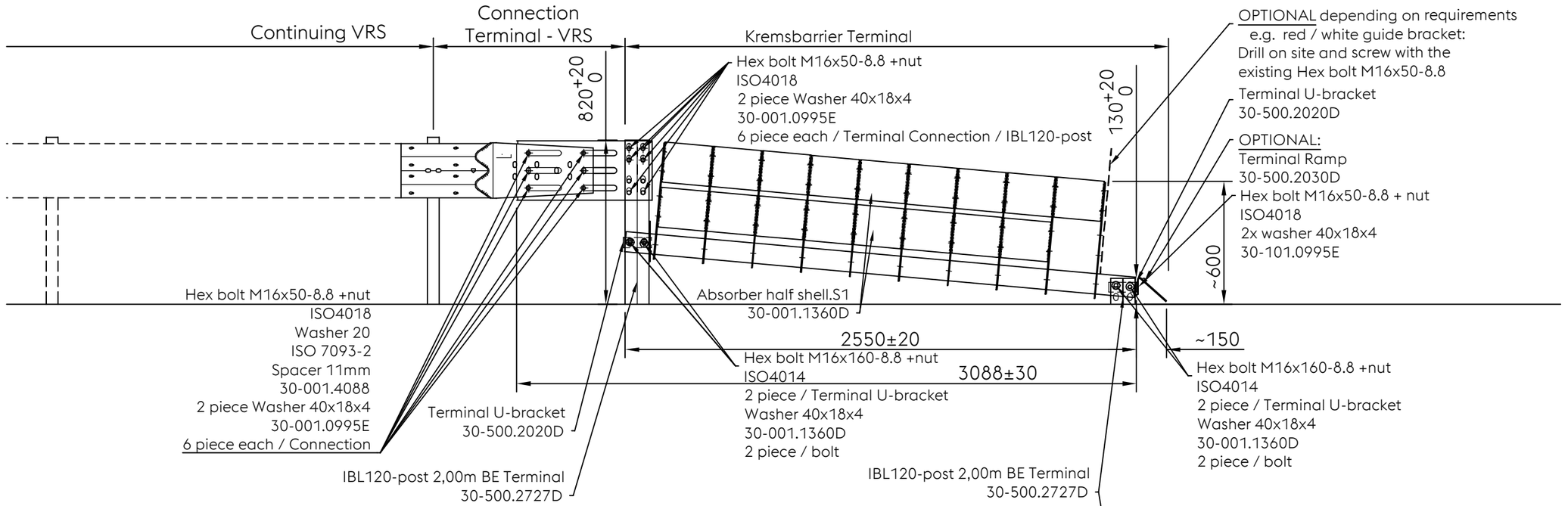


## Section: A-A

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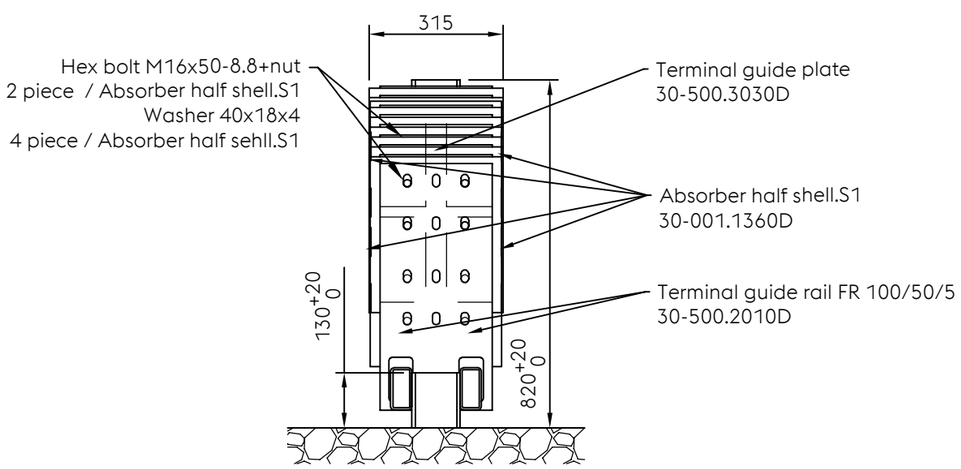


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# KREMSBARRIER TERMINAL P2

Data Sheet T80

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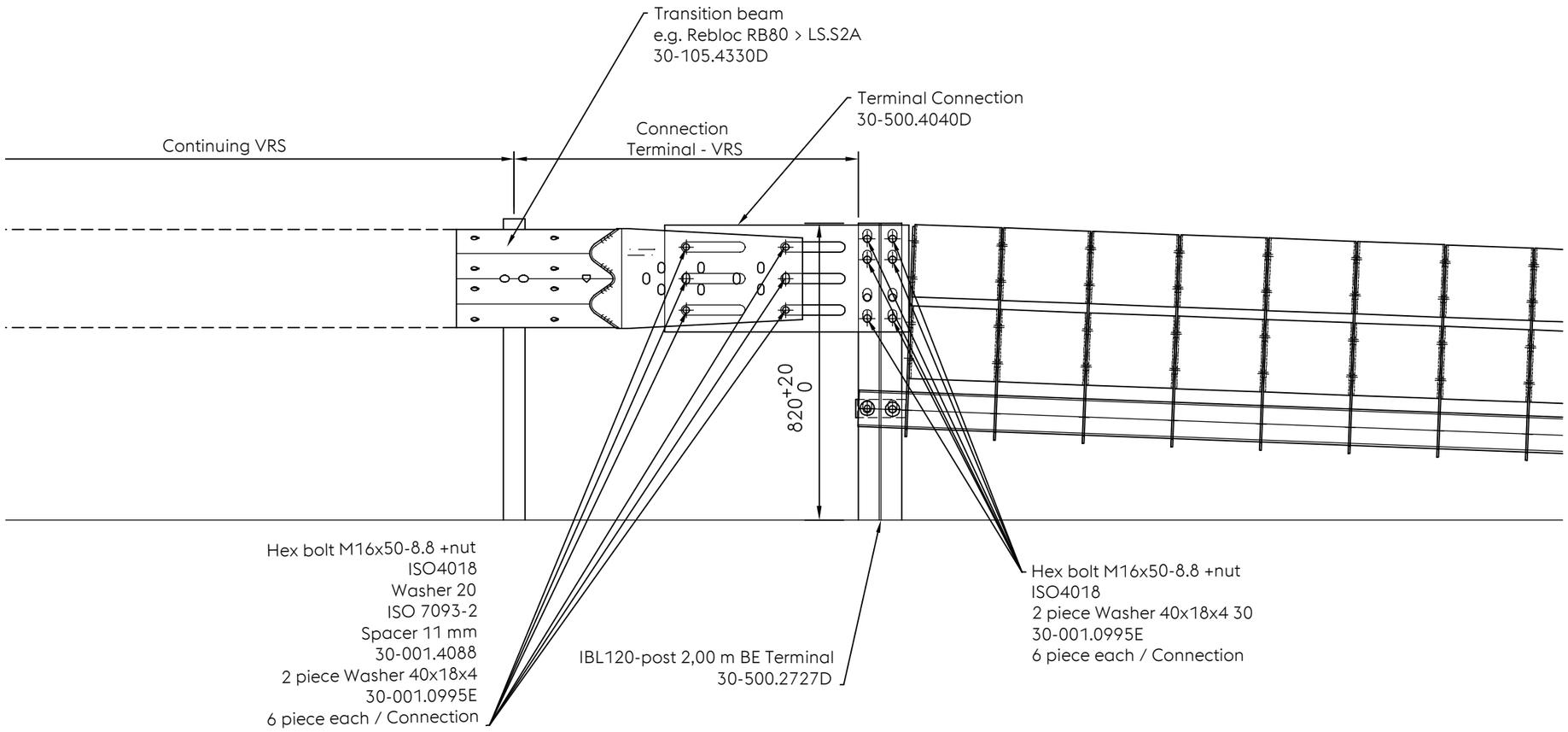


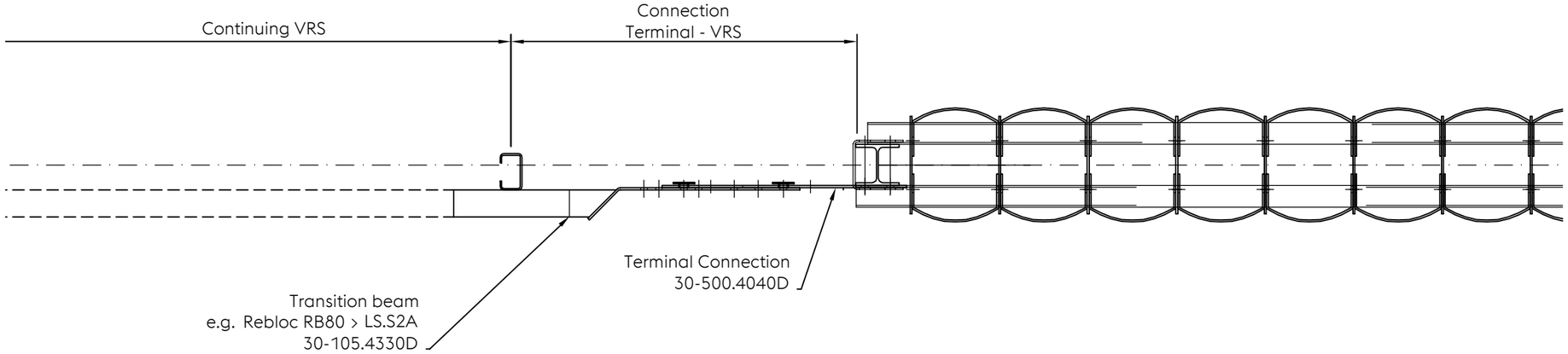


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# KREMSBARRIER TERMINAL Connection

Data Sheet T110A01

04/2024

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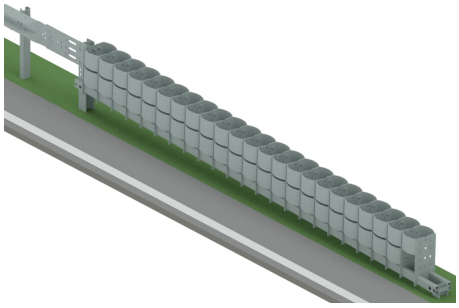
# Parts list
# KREMSBARRIER Terminal P4

Performance class 110 Terminal



Need for Terminal P4

| Piece | Component designation | Weight [kg] | Designation-number | Material / Quality | Corrosion protection |
|---|---|---|---|---|---|
| 2 | Terminal guide rail FR100/50/5 | 65,37 | 30-500.2010D | S355J0 | in accordance EN ISO 1461 |
| 2 | IBL120-post 2,00m BE Terminal | 42,7 | 30-500.2727D | S235JR | |
| 90 | Absorber Half Shell.S1 | 3,51 | 30-001.1360D | S355J0 | |
| 24 | Terminal guide plate | 5,15 | 30-500.3030D | S355J0 | |
| 2 | Terminal U-bracket | 0,81 | 30-500.2020D | S235JR | |
| 1 | Terminal Connector | 9,75 | 30-500.4040D | S355J0 | |
| *optional* | *Terminal Ramp* | *2,45* | *30-500.2030D* | *S235JR* | |
| Connectors | | | | | |
| 200 | Hex bolt M16x50-8.8 +nut | 0,14 | ISO 4018 | 8.8 | in accordance EN ISO 10684 |
| 6 | Hex bolt M16x160-8.8 +nut | 0,28 | ISO 4014 | 8.8 | |
| 436 | Washer 40x18x4 | 0,03 | 30-001.0995E | 100HV | |
| 6 | Spacer 11mm | 0,02 | 30-001.4088E | S235JR | |
| 6 | Washer 20 (60x22x4) | 0,08 | ISO 7093-2 | 100HV | |
| For connection Guardrail cross-section S2A | | | | | |
| 1 | Rebloc RB80 > LS.S2A | 11,98 | 30-105.4330D | S355J0 | in accordance EN ISO 1461 |



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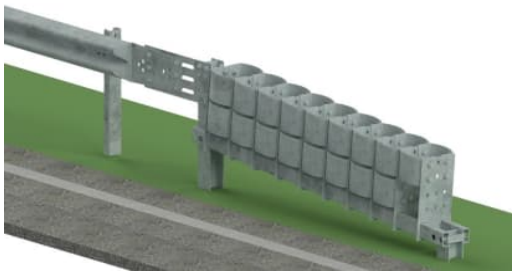
# Parts list
# KREMSBARRIER Terminal P2

Performance class 80 Terminal



Need for Terminal P2

| Piece | Component designation | Weight [kg] | Designation-number | Material / Quality | Corrosion protection |
|---|---|---|---|---|---|
| 2 | Terminal guide rail 2550mm | 27,78 | 30-500.2011D | S355J0 | in accordance EN ISO 1461 |
| 2 | IBL120-post 2,00m BE Terminal | 42,7 | 30-500.2727D | S235JR | |
| 34 | Absorber Half Shell.S1 | 3,51 | 30-001.1360D | S355J0 | |
| 10 | Terminal guide plate | 5,15 | 30-500.3030D | S355J0 | |
| 2 | Terminal U-bracket | 0,81 | 30-500.2020D | S235JR | |
| 1 | Terminal Connector | 9,75 | 30-500.4040D | S355J0 | |
| *optional* | *Terminal Ramp* | *2,45* | *30-500.2030D* | *S235JR* | |
| Connectors | | | | | |
| 88 | Hex bolt M16x50-8.8 +nut | 0,14 | ISO 4018 | 8.8 | in accordance EN ISO 10684 |
| 6 | Hex bolt M16x160-8.8 +nut | 0,28 | ISO 4014 | 8.8 | |
| 188 | Washer 40x18x4 | 0,03 | 30-001.0995E | 100HV | |
| 6 | Spacer 11mm | 0,02 | 30-001.4088E | S235JR | |
| 6 | Washer 20 (60x22x4) | 0,08 | ISO 7093-2 | 100HV | |
| For connection Guardrail cross-section S2A | | | | | |
| 1 | Rebloc RB80 > LS.S2A | 11,98 | 30-105.4330D | S355J0 | in accordance EN ISO 1461 |

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