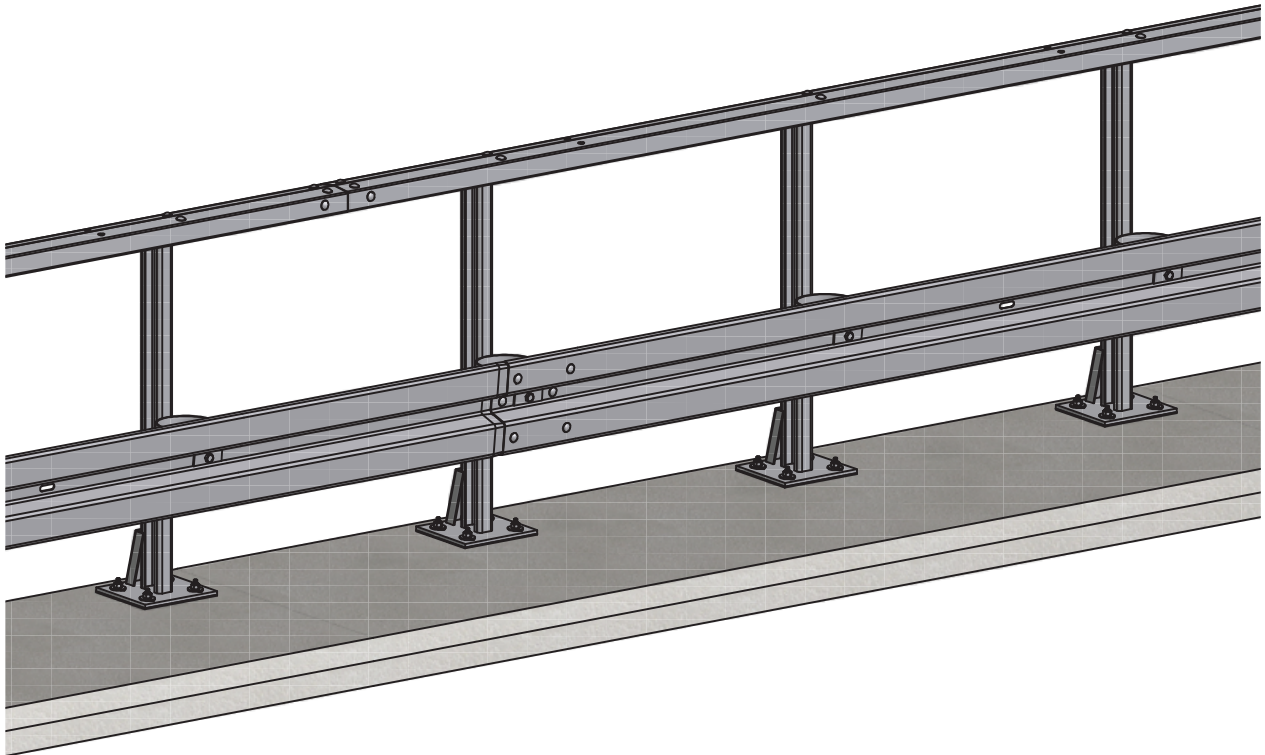


EASYRAIL 1.33 OS



Installation Manual Easy-Rail BD OS 1.33

Revision/Date: 9/13-05-2020

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1 General information

1.1 Preliminary remarks

The EasyRail 1.33 OS restraint system mainly consists of the following elements:

- Crash barrier bar, profile B
- Sectional railing post
- Post C-100-60-25 with base plate
- Supporting bracket
- Deformation element
- Handrail mounting with roof profile
- Screwing materials see bill of materials in Annex 1

which are combined to form a continuous crash barrier line.

To achieve the performance in accordance with the test reports required for the initial test (ITT), the following requirements need to be met precisely during installation and assembly. If these requirements are not complied with during installation without consulting the manufacturer, the warranty for defects for the construction product passes from the manufacturer to the assembly company.

1.2 Manufacturer

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1.3 Intended use

The EasyRail 1.33 OS is a vehicle restraint system (fall protection) for installation on bridges or strip foundations. It is used to protect uninvolved persons or areas next to a road that require protection or oncoming traffic and to protect the vehicle occupants when the vehicle veers off the road.

1.4 Storage and transport

All crash barrier structural parts have to be stored and handled properly.

They have to be protected against soiling, corrosion and damage. Structural parts laid out for assembly have to be installed soon.

During transport, the cargo has to be secured and personnel have to be equipped with personal protective equipment in accordance with the applicable national regulations.

2 Technical data

Containment level	H1
Class of working width	W4 (W=1,1 m)
Test length	36 m
ASI value	B
Construction height	120 cm (130 cm)
Construction width	42,0 cm
Post spacing	133 cm
Weight per metre	36,4 kg
Material	Steel S235JR/S355JR
Galvanisation (of steel and screws)	Hot galvanising in acc. w. EN ISO 1461 and EN 1179
Expected durability	Approx. 20 years, shorter under heavy exposure to corrosion

3 Installation instructions

3.1 General

3.1.1 Area of application / place of installation

The system is a guardrail system for installation on structures that has demonstrated the following performance classes in accordance with EN 1317-2:

- H1-W4-B

With regard to the selection of the place of installation, the applicable national regulations and the system performance arising from the results of the collision tests in accordance with EN 1317 (cf. „Technical data“ above) have to be observed.

As a rule, the place of installation has to be chosen thus that the space available behind the protective device is appropriate to the working width proven in the collision tests in accordance with EN 1317. However, this only applies to obstacles. In that case, any existing fall edge is not to be regarded as an obstacle because in the initial test the system has been installed at the rear edge of the edge beam and has demonstrated that the vehicle will be deflected. Therefore, the working width may in that case end behind the fall edge.

3.1.2 Installation limits

General limits of installation cannot be specified because of varying local situations. Where due the local conditions, any deviation from the basic design should be necessary, the necessary alterations always have to be made in consultation with the principal and the manufacturer. The generally accepted engineering standards have to be observed and complied with for the execution.

3.1.3 Minimum installation lengths

The minimum installation length of the EasyRail 1.33 OS is 36 m. Where only less than the required test length can be installed, this means a deviation from the test installation and thus from the system. The construction changed (shortened) in this way is a non-certified special design.

3.1.4 Transition at start and end of a structure

The crash barrier system has to be continued in front of and behind the structure and connected to the continuous driven-in EasyRail 1.33 crash barrier system or to another suitable vehicle restraint system by means of friction-locked transition constructions. The transition is to be made as specified by the manufacturer of the EasyRail 1.33 OS.

3.1.5 Admissible installation temperatures

If the crash barrier is installed in Germany, installation is not dependent on the ambient temperature at the time of installation. In regions where the minimal outside air temperature T_{min} in accordance with EN 1991-1-5/NA is below -24°C , installation requires the manufacturer's written confirmation.

3.1.6 Requirements on the assembly personnel

Assembly must be carried out exclusively by trained and qualified specialist personnel. The assembly personnel used must be supervised at all times by a person having suitable expert knowledge. In Germany, section 2.4.1.1 „Assembly personnel“ of ZTV-PS 98 applies. In particular, assembly personnel working in Germany have to be supported by a trained crash barrier assembly expert.

3.1.7 Check of the delivery/marking of the parts

At the place of installation, the system components supplied have to be checked for completeness and absence of faults and damage based on the delivery notes. The bills of materials provided in Annex 1 have also to be used for this.

Special components of the EasyRail 1.33 OS are marked as shown in Annex 2.

The supplier has to be notified without delay if any damage, defect or incorrect delivery is detected. Packaging materials have to be disposed of in accordance with the local applicable regulations.

3.1.8 Traffic safety measures

Take the traffic protection measures usual at construction sites as provided for by the applicable national regulations.

3.1.9 Personal protective equipment

Suitable personal protective equipment and reflective clothing in accordance with the local regulations in the respective country have to be worn during all work.

3.2 Assembly

The EasyRail 1.33 OS has as a rule to be assembled in accordance with the assembly drawings provided in Annex 3.

Avoid damage to the galvanised surfaces during the aligning of crash barrier lines. Beating galvanised surfaces directly with a hammer is not admissible.

Small flaws in the zinc coat have to be touched up in accordance with EN ISO 1461 after careful preparation by applying a suitable zinc powder paint.

Only new screwing materials must be used for the assembly (new installation and conversion) and repair of crash barriers.

3.2.1 Installation heights and limits of steps in front

The installation heights depend on the distance of the system from any kerb in front and the height of that kerb.

In usual cases, i.e. kerbs with height differences of up to 7.5 cm, the system height is 120 cm (or 130 cm) ± 3 cm referred to the upper edge of the edge beam or the strip foundation at the level of the post axis. In that case, the crash barrier bar has to be installed at a height of 65 cm ± 3 cm, measured directly in front of the system. The distance between the front edge of the system and the road edge should usually be 135 cm (normal case).

For other installation situations, please refer to the schematic diagram in Annex 5. In these special cases, the intended installation has to be approved by the client.

3.2.2 Foundation / strip foundation

The EasyRail 1.33 OS must be used exclusively on suitable edge beams and strip foundations.

The inclination of the founding should be 0 - 6%. At inclinations exceeding 12%, the system is to be deemed a non-tested special construction that has to be authorized by the client.

Suitability of an edge beam may be assumed if it has been built in compliance with the requirements of BASt/BMVBS as shown on the appropriate guideline drawings (RiZ-ING) for edge beams. Other civil engineering structures have to be made in accordance with the specifications of the strip foundations with regard to minimum dimensions, concrete quality and minimum reinforcement. The minimum requirements for a strip foundation (dimensions, minimum reinforcement etc.) are described and shown in Annex 6.

Installation of crash barrier posts directly into concrete is not admissible.

3.2.3 Posts

The guardrail is anchored on the structure by means of steel sectional posts which can be anchored on concrete or steel bases using a base plate adjusted to the inclination (usually on bridges). These assembly instructions together with the assembly drawings have to be observed for the arrangement and anchoring of the posts by means of base plates.

Adhesive anchors type Hilti HAS-F M16x125 with HVU mortar cartridge have to be used to screw the posts to the ground using base plates. As an alternative, prefabricated anchoring cages may also be installed, provided they comply with anchor strength 8.8.

Both adhesive anchors and prefabricated anchoring cages must not project out of the concrete more than specified by the manufacturer.

The oblong holes in the base plates must carefully filled with permanently elastic material or covered.

The single parts of the anchor construction used must be hot galvanised in accordance with EN ISO 1461 and EN 1179 or equivalent to provide protection against corrosion. Stainless steel parts must not be used. The anchor screws and nuts must not be covered with plastic caps.

a. Inclination of the posts

When installing posts with base plates, it has to be ensured that they have been manufactured for the correct direction of traffic and transverse slope of the ground. While the transverse slope needs to be equalised, so that the posts stand upright transverse to the direction of traffic, the longitudinal slope of the structure/road is not equalised. Viewed in the longitudinal direction, the posts are installed at right angles to the structure. The base plates of the posts must be fully supported on an even concrete surface.

b. Installation direction of the posts

The stiffening profiles between the C profile and the base plate have to be installed at the side not facing the direction of traffic. The post profiles have to be installed with their closed sides facing the direction of traffic.

c. Installation of the adhesive anchors

The usability of the Hilti adhesive anchors type HAS-F M16x125 - 8.8 (with HVU mortar cartridge) may only be assumed if the following is observed with regard to installation:

- Installation by appropriately trained personnel
- Minimum concrete quality C25/30, XD3 + XF4, nominal dimension of the concrete cover 5.0 cm outside, perfect compaction of the concrete, e.g. no significant hollow spaces
- Installation only as supplied by the manufacturer, without exchanging the individual

components

- Observance of the effective anchoring depth = drill hole depth of 125 mm; the adhesive anchor rods must not be shortened if there is an obstacle. The adhesive anchor rod has to be turned in up to the marking.
- The minimum distance from edges and joints is 15 cm and must not be less.
- Drilling using carbide hammer drills in accordance with ISO or national standards or Hilti diamond core drilling system DD-EC 1. Drilling diameter \varnothing 18 mm. Pneumatic drilling machines/hammers and other core drilling machines are not admissible.
- Faulty boreholes have to be cemented.
- Borehole cleaning: Remove any water in the hole and clean by blowing it at least four times using a hand pump or oil-free compressed air (ISO 8573-1, table 7.3, oil class 4, $< 5\text{mg}/\text{m}^3$).
- The temperature of the plug parts and in the anchoring ground during installation and curing must not be less than -5°C ; observe the times to wait until stressing by the post installation as per table 6 in Annex 4.
- Fastening of the base plates after the waiting time with a torque wrench observing the torques specified at 3.2.4.

The work steps are shown on the packages of the adhesive anchors but they are also shown in Annex 4.

Any deviation from this installation process means that the construction is a non-certified special design which is permissible only after consultation with the principal and the manufacturer.

If prefabricated anchoring cages are used, they have to be properly connected to the reinforcement of the edge beam or strip foundation and adjusted in such a way that later installation of the posts with base plate is possible.

d. Rubber plate / mortar

Usually, a rubber plate should be installed between the concrete surface and the base plate of the post when the posts are installed. This is to equalise small height differences in the concrete surface and at the same time prevent that dirt and humidity gather under the base plate which might result in increased corrosion. At temperatures of below $+5^\circ\text{C}$ and existing humidity, the rubber plate must be used only after consultation with the principal and the manufacturer.

As an alternative, plastic cement (PC) or plastic-mixed materials (PCC) may also be used, provided they comply with TL BE-PCC and the equalisation layer between base plate and concrete is not thicker than 5 mm on average.

3.2.4 Screwed connections/tightening torques

To achieve a perfect connection, the screws need to sit vertically in the structural parts to be connected and be properly tightened. The screwing tools have to be adjusted appropriately.

To prevent damage to the zinc coat when the nuts are tightened, a washer has to be placed under each nut. Fishplates must not to be used to substitute washers.

The individual tightening torques are as shown below:

Art. no.	Screw	Torque
040.00	HRK (button head) screw with nib, M 16x27, incl. nut, 4.6	70-140 Nm *)
040.15-1	Hex head screw M 16x65, Mu, 4.6	70-140 Nm
040.41	Hex head screw M 10x30, Mu, 4.6	10-17 Nm (hand- tight)
040.80	Hex head screw M 14x30, Mu, 4.6	70-140 Nm
041.05	Hilti adhesive anchor HAS-F M16 w. HVU foil cartridge	90 Nm
041.10	Prefabricated anchoring cage 150/200 mm, galvanised, M16-8.8	70 Nm

*) Note: Position the nose of the button head screw in the tip of the drip hole.

Tools required for screwing are suitable wrench sockets or wrenches.

3.2.5 Supporting brackets and deformation elements

Supporting brackets and deformation elements must as a rule be installed at right angles to the crash barrier bar, deviations being permissible within the possible movement range provided by the oblong hole in the crash barrier.

3.2.6 Handrail mountings with roof profile

Handrail mountings have to be screwed in parallel with the post profiles. The railing posts have to be fully supported on the contact surfaces of the handrail mountings.

3.2.7 Crash barrier bars

The bars must overlap at the butts as a rule in the direction of traffic.

3.2.8 Railing posts

The railing posts have to be installed in such a way that successive bars are aligned, i.e. the railing posts must not have a horizontal or vertical offset to each other.

3.2.9 Dilatation joints

Dilatation joints are specially shaped connections of crash barrier bars and other longitudinal components (e.g. box section bars or railing posts) among each other which allow lengthwise changes due to thermal influences without a considerable reduction of the passive safety of the crash barrier system (usually in the area of moving carriageway transitions, at bridges and at central reservation crossings).

In the area of moving carriageway transitions, dilatation joints have to be installed symmetrically. With regard to this, installation of the posts with base plates must always start at the movement joint. Dilatation joints are always to be supplied preassembled to the construction site and installed on the structure with the post spacing required in each case.

The average structure temperature at the time of installation is relevant to the adjustment of the dilatation joints. The bridge's movement due to temperature changes needs to be taken into account when installing the posts or prefabricated anchors at the expansion joint.

+10°C is regarded as the zero position for the dilatation joints at which the oblong holes are precisely congruent or the hole patterns are aligned symmetrically. With regard to this, the post spacing must be exactly 1333 - 1334 - 1333. Accordingly, the post spacing relevant for installation results from the system length of the dilatation joint of 4,000 mm plus/minus length change.

The screws in the dilatation joints must be tightened only so far that the length movement cannot be impaired. The nuts have to be properly locked with locknuts (minimum tightening torque approx. 70 Nm).

Dilatation joints are not necessary for spanned lengths of less than 30 m. On long bridges with large spans between supports, the resulting length changes are different for the structure and the crash barrier primarily due to the fact that the effect of temperature changes on the structure is substantially slower than on the crash barrier. Therefore, 80 mm dilatation joints to compensate for the stresses should be provided at least every 100 m in such a case.

3.3 Deviations from the basic design

The EasyRail 1.33 OS has been tested in accordance with EN 1317 on a straight crash barrier line on a structure edge beam with an inclination of 4% as per KAP 1 (RiZ-ING). Should due to the local conditions any considerable deviation from that basic design be necessary, this may only be done by means of a non-certified special design which may not have the same characteristics as the tested and certified EasyRail 1.33 OS crash barrier system. In such a case, it is absolutely necessary to obtain the approval of the principal and the manufacturer.

The generally accepted engineering standards have to be observed and complied with when making any alteration. No alterations must be made which obviously result in an impairment of the function of the crash barrier system.

If subsequent work on crash barrier components is necessary, no deviation must be made to the standard parts which might impair their function. This in particular goes for the production of adjusting pieces (hole spacing, hole diameters, number of screws, joint overlap) and the shortening of posts. Cut edges have to be sufficiently protected against corrosion with a suitable coat of zinc powder paint.

3.3.1 Fitted Pieces

To produce the length of the crash barrier line required under the local conditions, it may be necessary to use beams that are shorter than the standard components. Appropriate adjusting pieces may be produced at the workplace. In this respect, the following conditions have to be met:

- Minimum length 750 mm due to the necessary 30 cm profile overlap (30 cm + 15 cm + 30 cm)
- No overlapping of the specified post spacing of the crash barrier construction during installation
- Proper cutting with a cutting-off machine or a saw
- Proper drilling of the screw holes using a drilling machine
- Proper treatment of cut edges and surfaces and drilled screw holes with suitable zinc powder paint

Installation of such adjusting pieces must be restricted to a minimum. Adjusting pieces must be installed in exceptional cases only (e.g. between two bridge structures).

In the case of special construction measures on the central reservation such as crossings, tunnels or bridge structures, passages to concrete protective walls etc., not more than one or two adjusting pieces should be used between such measures.

The same goes for bridge structures, where not more than one adjusting piece per sub-section between two carriageway transitions should be made. The dilatation joint of any of the longitudinal elements must not be shortened under any circumstance.

When carrying out maintenance or repair work, it should be attempted to do without adjusting pieces even if this means increased expenditure for dismounting and reassembly of the connection areas which are not damaged.

Structural parts must be altered only properly using drilling and cutting tools. Work on structural parts using welding or flame-cutting tools, arbor or striking tools or bending tools is not permissible.

3.3.2 Radii

When installing radius bars, it has to be ensured that they are installed without tension.

Pre-bent bars (so-called radius bars) have to be used in bends with radii < 30 m.

Radius bars are available at 2.5 m steps:

25 m – 22.5 m – 20 m – 17.5 m – 15 m – 12.5 m – 10 m – 7.5 m – 5 m – 2.5 m

Convex radii have to be used for outer curves and concave radii for inner curves. It is not admissible to bend crash barrier bars so much on the construction site or during installation that permanent deformation occurs.

It has to be ensured that no gap is created at the joint overlap due to the screwing. It is advisable to first screw the joint overlap and then fasten the bar to the deformation tubes. Holes must not be flared, e.g. by means of broaching.

As a rule, radii are non-certified designs which do not have the same characteristics as the tested system. Radius bars may be used where no more suitable vehicle restraint systems (tested and certified for the situation) can be used in the place in question.

3.3.3 Additional components

Attaching additional components may have a negative effect on the performance of the system or pose a danger. Accordingly, it is not permitted to attach additional components.

In particular, attachment of traffic signs directly on the system is prohibited. Erection of traffic signs within the working width is permitted only if they can be knocked down or sheared off safely.

If additional components are to be attached nevertheless, this may be done only with the written consent of the manufacturer. The manufacturer's approval is deemed to have been given for the following additional components, provided that any reduction of the system's performance and any risk for third parties can be ruled out due to the kind of attachment:

- Top marker posts which are fastened to the post
- Top marker posts which are fastened to the bar together with the joint screw connection
- Crash barrier reflectors which are fastened to the bar at the centre holes using button head screws
- Crash barrier post sheathings in accordance with TL-SPU

The mountings of the additional components have to be suitable to effectively prevent that the additional component is hurled off in the event of a vehicle collision.

3.4 Checking, self-monitoring report

After assembly, the construction has to be checked for compliance with this manual in accordance with the generally accepted engineering standards and using the self-monitoring report provided in Annex 7. Particular attention has to be paid to adherence to the assembly tolerances, tight fit of the screwed connections and proper alignment of the crash barrier line and

the individual components.

3.4.1 Assembly tolerances

The assembly tolerances are shown in the table below:

Dimension	Tolerance
Post spacing in longitudinal direction	± 21 mm
Alignment deviation of posts or bars	Over a length 12 m: ± 30 mm
Deviation of upper edge of the bar in vertical direction	± 30 mm
Deviation of the adhesive anchors transverse to the direction of traffic	± 21 mm
Deviation of the ground from the post inclination	± 2 %

The tightening torques of the screwed connections have to be checked randomly. The minimum values specified at 3.2.4. hereof need to be achieved.

If more than 10% of the screwed connections checked do not achieve the minimum values, then all screwed connections have to be checked.

3.4.2 Adhesive anchors and posts with base plates

On bridges/strip foundations and other civil engineering structures, the tight fit of the adhesive anchors has to be checked on not less than 3% of the anchor screwed connections. After the test, the anchor has to be released and tightened with the torques specified at 3.2.4 hereof. There must be no considerable slippage and the structure must not be damaged in the test. A test report of the anchor inspection has to be written. The report in Annex 8 may be used for this.

If faulty anchorings are found, the following procedure applies:

If less than 50% of the anchors (but at least one anchor) tested are faulty, then at least two more anchors have to be tested at the posts affected and their left and right neighbour posts. If another faulty anchor is found at one of these three posts, then all anchors of the structure/strip foundation have to be checked.

If more than 50% of the anchors tested are faulty, then all anchors of the structure/strip foundation have to be checked.

If prefabricated anchoring cages have been used instead of adhesive anchors, a check is not necessary if the manufacturer's certification for the anchoring cages is available.

The adhesive anchors have to be checked using the Hilti DPG 100 testing device. In the test, an axial tensile load of not less than 50 kN (norm. 55 - 65 kN) has to be transmitted to the anchors. During the load application phase, the test load must not be lower than 50 kN for

1 - 2 minutes.

4 Repair, inspection and maintenance

The installed guard usually does not require special maintenance. Soiled parts may be cleaned without much expenditure using a pressure cleaner.

In the event of damage, as a rule all crash barrier components have to be replaced which are permanently deformed (plastic deformation).

If components of a crash barrier line are not permanently deformed, the crash barrier construction has to be aligned.

If damaged crash barrier components are exchanged, special care needs to be taken with regard to work at the transition areas to the undamaged bars due to possibly increased tension of the construction. The bars remaining after dismounting must not be damaged (e.g. by the use of angle grinders, arbors or hammers). Due to temperature-related changes of length or major deflection in case of heavy collision, the hole patterns in longitudinal direction often no longer fit when connecting the new bars to the existing crash barriers. Where the distance between the hole axes is less than 5 cm, the difference may in most cases be compensated by loosening the screws at several joints. Otherwise, the following procedure is to be applied:

If repair work is carried out at very low temperatures, the necessary installation lengths may increase due to the temperature-related shortening of the existing bars (SP-bar and railing post) so far that they exceed the length of a bar (e.g. 4.07 m). Drilling of new holes for the joint screw connection is prohibited in that case!

Instead, two adjusting pieces have to be made to achieve the necessary total installation length of more than 4.00 m (example: 2.00 m + 2.07 m = 4.07 m). Moreover, an additional post has to be installed to avoid exceeding the maximal admissible post spacing at the respective location.

If, however, the installation space available is smaller than the length of a bar, new holes may be drilled. However, this is admissible only if the distance between the new (material) outer edges and the existing boreholes is greater than 2.5 cm (hole embrasure).

As a rule, however, adjusting pieces and drilling of new holes should be avoided even where this means additional expenditure due to the dismounting and reassembly of the adjoining areas.

Damaged adhesive anchors / anchoring cages embedded in concrete have to be replaced with new ones. The thread ends of the anchors that project out of the concrete have to be cut off flush using an angle grinder and the cut surfaces have to be suitably protected against corrosion. To not reduce the efficiency of the new anchoring, the post needs to be relocated in longitudinal direction to enable installation of the new adhesive anchors. Moreover, an additional post is necessary because otherwise the admissible post spacing of 1.33 m would be

exceeded.

4.1 Reusability of crash barrier components

Crash barrier components may be reused for retrofitting and/or conversion if

- the components do not have visible deformation and/or damage (e.g. torn open, flared or burnt out holes)
- the structural parts have a minimum residual zinc coat thickness of 55 µm
- the manufacturer's mark and the test period mark are still well visible on components which require marking.

Already installed mounting parts (screws, nuts, washers, covering lugs, connecting lugs) must not be reused. New parts must be used always. Only new parts must be used to repair accident damage.

Structural components which can no longer be used have to be made unusable e.g. by cutting off parts or cutting them into pieces and, just like dismantled screwing parts, supplied to recycling in accordance with the national regulations.

4.2 Disposal/recycling

All damaged components and components which can no longer be used have to be disposed of or recycled or reused in other areas (e.g. agriculture, support for solar cell panels, private enterprises).

5 Information on toxic substances

The individual crash barrier components are made of two basic materials:

- Steel
- Zinc (hot galvanisation)

Both materials are not toxic and do not require special treatment or handling.

For on-site assembly, some supplies are required to operate the machines and tools. They may include the following:

- Diesel fuel (e.g. compressor)
- Pneumatic oil (e.g. operation of the compressed air tools)
- Petrol (e.g. cutting-off machine)
- Lubricating and cutting paste (for drilling holes into crash barrier components)

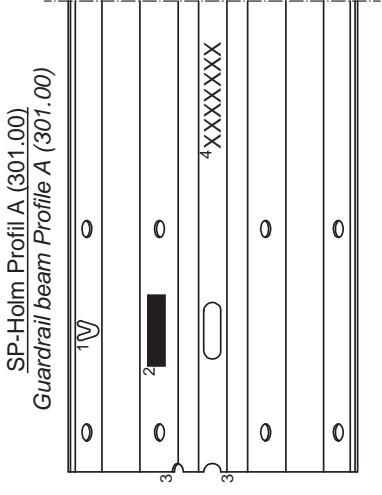
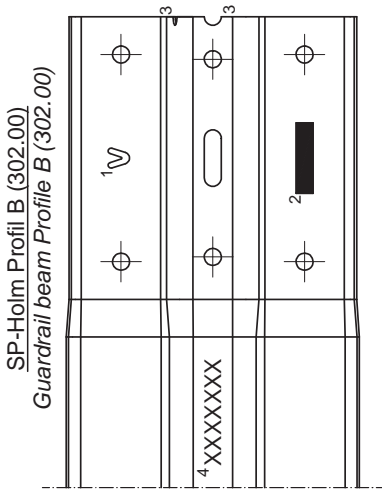
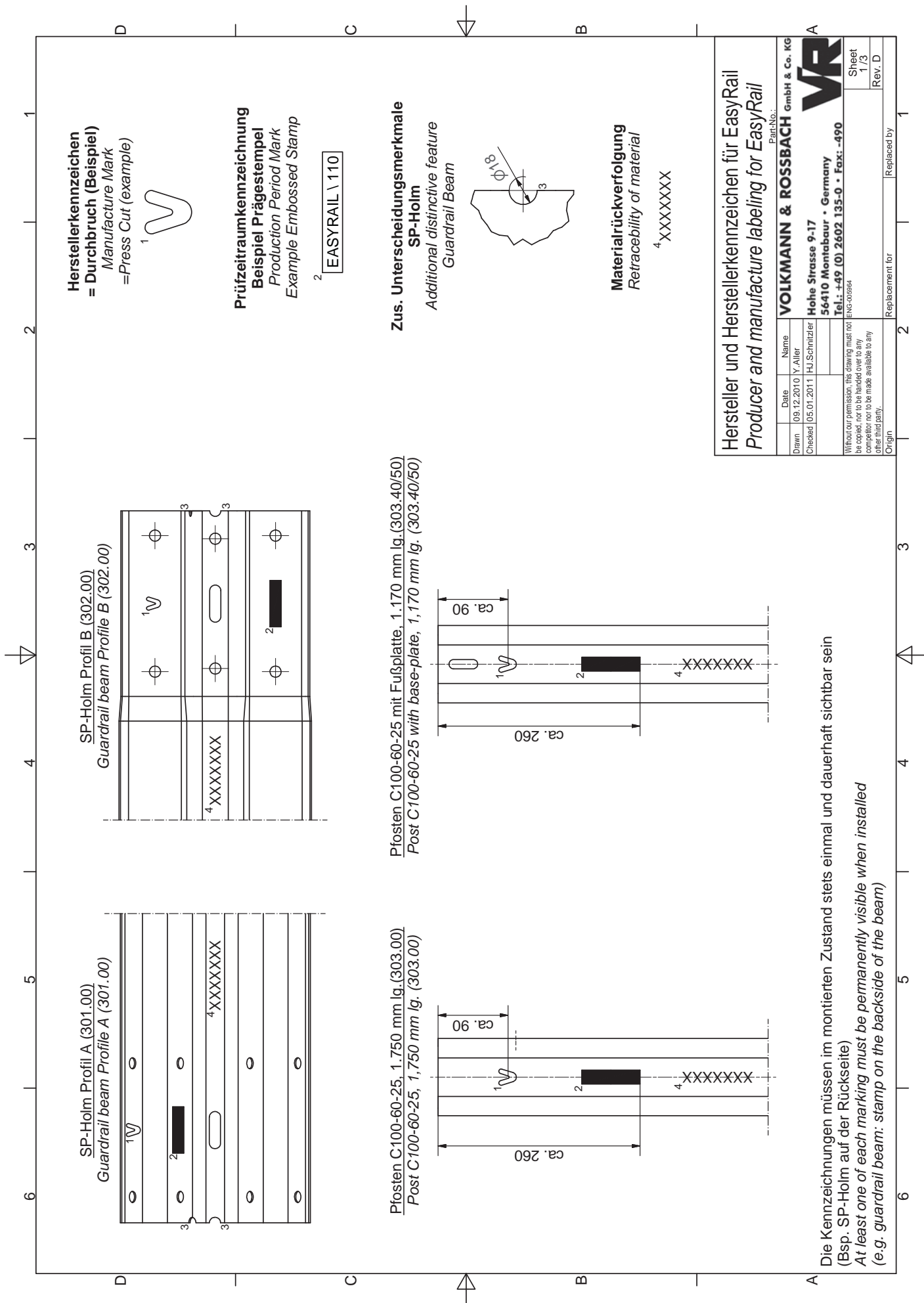
With regard to this, the appropriate manufacturer's instructions and the regulations that apply in the respective country have to be observed and complied with.

Appendix 1 - Parts List (4 m Section)

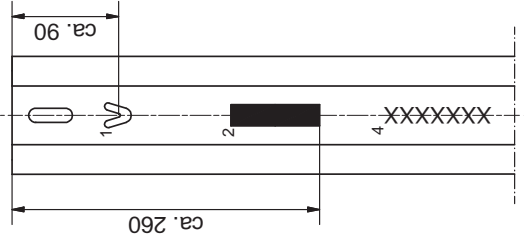
Easy-Rail 1.33 OS, Profil BD, Height 1.2 m

Qty./4m	Order No.	Item	Weight
3	010.00	Butt Plate M 16	0,200 kg
20	040.00	HRK (round head) Bolt with Nib M 16x27, 4.6 with Nut	0,100 kg
3	040.15-1	Hexhead bolt M 16 x 65 with nut, 4.6	0,170 kg
23	040.30	Flat washer 18, DIN 126	0,010 kg
3	040.41	Hexhead bolt M 10 x 30 with nut, 4.6	0,040 kg
3	040.62	Flat washer Ø10,5, DIN 7349	0,013 kg
6	040.80	Hexhead bolt M 14 x 30 with nut, 4.6	0,080 kg
6	040.82	Flat washer Ø 16, DIN 126	0,008 kg
12	041.05	Hilti chemical anchor HAS-F M16 with adhesive capsule HVU	0,210 kg
3	041.20	Rubber plate 250 x 300 x 3 mm	0,300 kg
3	060.09	Deformation element for S-R Plus Ø 193,7 x 4,5, 180 mm lg.	3,800 kg
1	302.00	Guardrail beam, profile B, t=2.5mm	38,370 kg
3	303.40	Post C100-60-25 with base plate, 1,170 mm lg., C right-side, 4%	19,140 kg
3	304.10	Support bracket, profile B, inclined by 6°	1,200 kg
1	322.01	Profiled railing 3,998 mm, t=2.5mm	23,650 kg
1	322.10	Profiled railing butt joint	2,260 kg
3	322.20	Roof-shaped hand rail support	0,510 kg

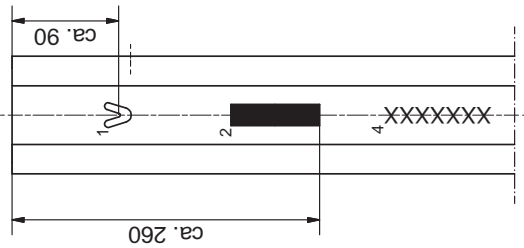
Appendix 2 - Marking of Parts



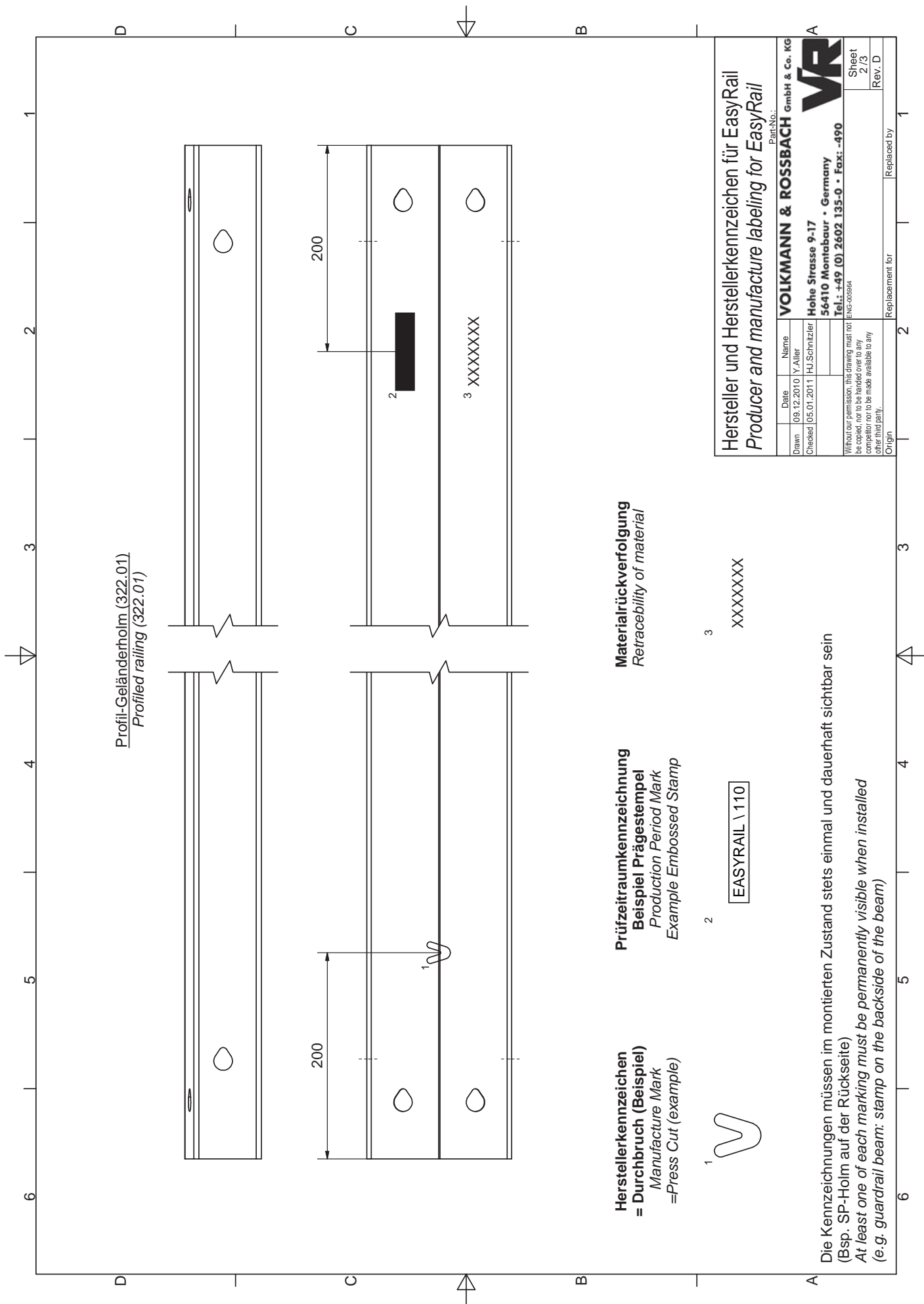
Pfosten C100-60-25 mit Fußplatte, 1.170 mm lg. (303.40/50)
Post C100-60-25 with base-plate, 1,170 mm lg. (303.40/50)



Pfosten C100-60-25, 1.750 mm lg. (303.00)
Post C100-60-25, 1,750 mm lg. (303.00)



Die Kennzeichnungen müssen im montierten Zustand stets einmal und dauerhaft sichtbar sein
(Bsp. SP-Holm auf der Rückseite)
At least one of each marking must be permanently visible when installed
(e.g. guardrail beam: stamp on the backside of the beam)



Profil-Geländerholm (322.01)
Profiled railing (322.01)

Herstellereigenschaften
= Durchbruch (Beispiel)
Manufacture Mark
= Press Cut (example)



Prüfzeitraumkennzeichnung
Beispiel Prägestempel
Production Period Mark
Example Embossed Stamp



Materialrückverfolgung
Retraceability of material



Die Kennzeichnungen müssen im montierten Zustand stets einmal und dauerhaft sichtbar sein
(Bsp. SP-Holm auf der Rückseite)
At least one of each marking must be permanently visible when installed
(e.g. guardrail beam: stamp on the backside of the beam)

Hersteller und Herstellerkennzeichen für EasyRail
Producer and manufacture labeling for EasyRail

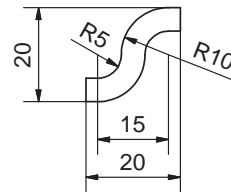
Date	Name	Part-No.: VOLKMANN & ROSSBACH GmbH & Co. KG
Drawn 09.12.2010	Y.Aller	
Checked 05.01.2011	H.J.Schnitzler	Hohe Strasse 9-17 56410 Montabaur • Germany Tel.: +49 (0) 2602 135-0 • Fax: -490 ENG-005804
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Origin	Replacement for	Replaced by
	2	1
	3	2/3
		Rev. D



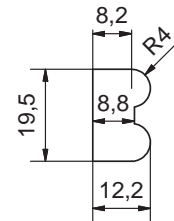
Freigegebene Hersteller und Herstellerkennzeichen für EasyRail
Approved producer and manufacture labeling for EasyRail

Stand/date: 04.04.2011

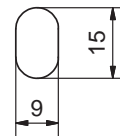
SPIG Schutzplanken-Produktions GmbH
 Schmelzer Straße 7
 66839 Schmelz-Limbach



BBV Baustahl und Blechverarbeitungsgesellschaft mbH & Co. KG
 Am Lokwerk 11
 14774 Brandenburg



KFS Kirchmöser Formstahl GmbH
 Am Lokwerk 11
 14774 Brandenburg



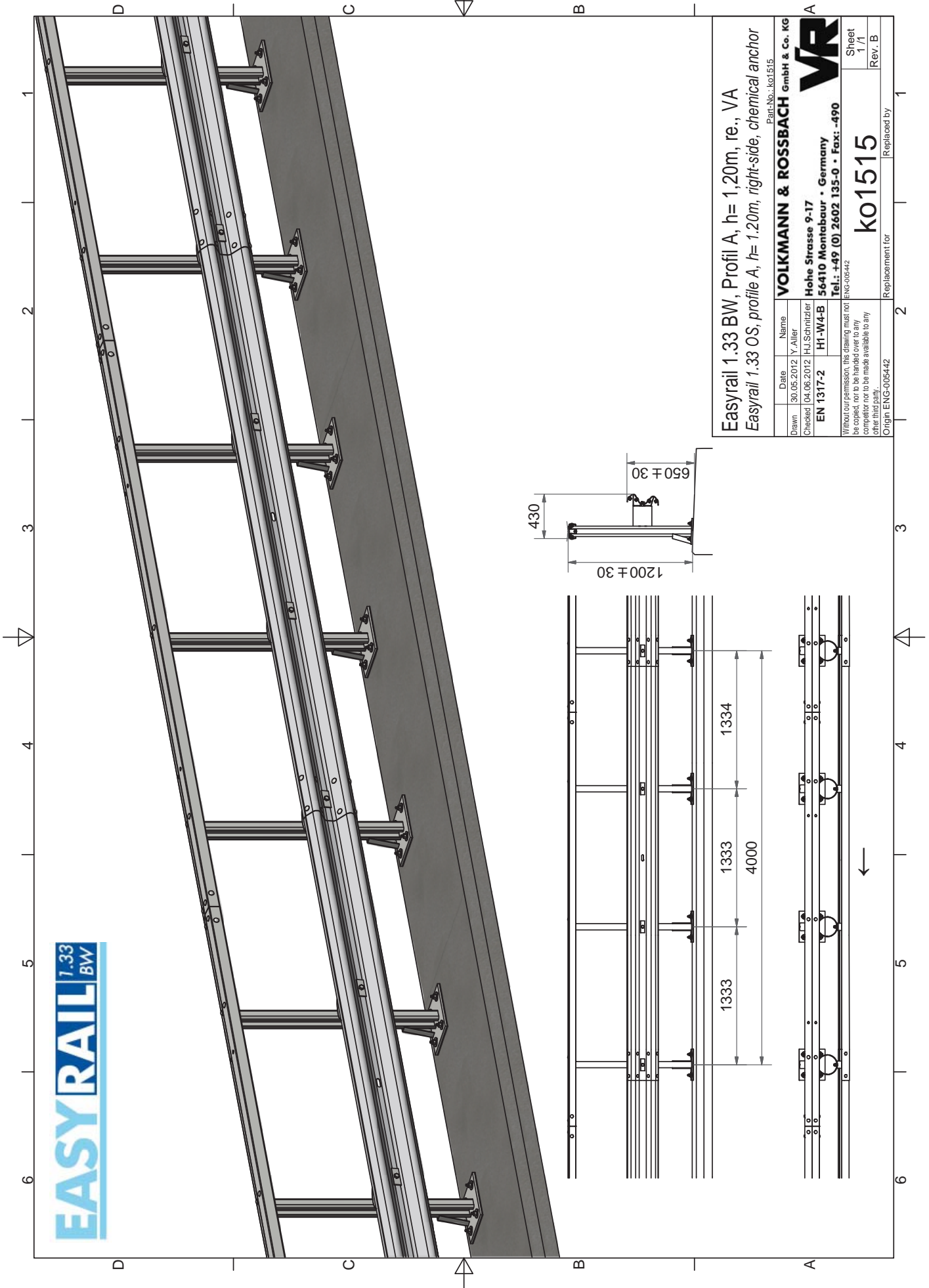
Hersteller und Herstellerkennzeichen für EasyRail
 Producer and manufacture labeling for EasyRail

Date		Name		Part-No.:	
Drawn	09.12.2010	Y.Aller	VOLKMANN & ROSSBACH GmbH & Co. KG		
Checked	05.01.2011	H.J.Schnitzler	Hohe Strasse 9-17		
				56410 Montabaur · Germany	
				Tel.: +49 (0) 2602 135-0 · Fax: -490	
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Origin		Replacement for		Replaced by	
				Rev. D	



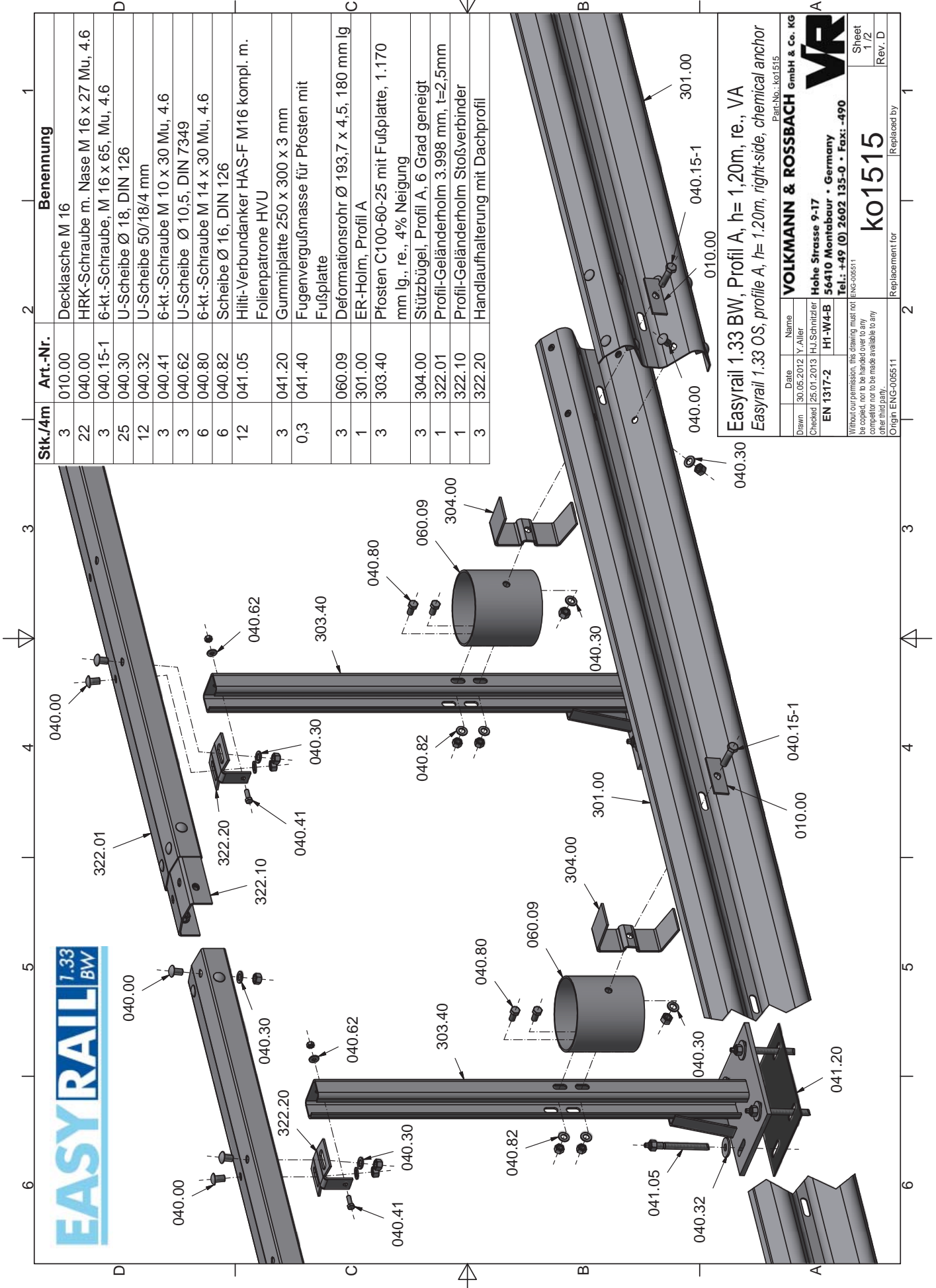
Appendix 3 - Drawings

System Drawing (A-Profile, Height 1.2 m)



Easyrail 1.33 BW, Profil A, h= 1,20m, re., VA Easyrail 1.33 OS, profile A, h= 1,20m, right-side, chemical anchor PartNo.: kot1515		VOLKMAN & ROSSBACH GmbH & Co. KG Hohe Strasse 9-17 56410 Montabaur · Germany Tel.: +49 (0) 2602 135-0 · Fax: -490 ENG-005442		VR Sheet 1 / 1 Rev. B
Drawn: 30.05.2012 Y. Aller Checked: 04.06.2012 H.J. Schmitzler EN 1317-2 HI-W4-B Without our permission, this drawing must not be copied, nor be handed over to any competitor nor to be made available to any other third party. Origin: ENG-005442	Date: 30.05.2012 Name: H.J. Schmitzler HI-W4-B Replaced by:	Replaced by:	Replaced by:	
Replacement for:		k01515		

Appendix 3 - Page 2
 Assembly Drawing (A-Profile, Height 1.2 m)



Stk./4m	Art.-Nr.	Benennung
3	010.00	Decklasche M 16
22	040.00	HRK-Schraube m. Nase M 16 x 27 Mu, 4.6
3	040.15-1	6-kt.-Schraube, M 16 x 65, Mu, 4.6
25	040.30	U-Scheibe Ø 18, DIN 126
12	040.32	U-Scheibe 50/18/4 mm
3	040.41	6-kt.-Schraube M 10 x 30 Mu, 4.6
3	040.62	U-Scheibe Ø 10,5, DIN 7349
6	040.80	6-kt.-Schraube M 14 x 30 Mu, 4.6
6	040.82	Scheibe Ø 16, DIN 126
12	041.05	Hilit-Verbundanker HAS-F M16 kompl. m. Folienpatrone HVU
3	041.20	Gummiplatte 250 x 300 x 3 mm
0,3	041.40	Fugenvergüßmasse für Pfosten mit Fußplatte
3	060.09	Deformationsrohr Ø 193,7 x 4,5, 180 mm lg
1	301.00	ER-Holm, Profil A
3	303.40	Pfosten C100-60-25 mit Fußplatte, 1.170 mm lg., re., 4% Neigung
3	304.00	Stützbügel, Profil A, 6 Grad geneigt
1	322.01	Profil-Geländerholm 3.998 mm, t=2,5mm
1	322.10	Profil-Geländerholm Stoßverbinder
3	322.20	Handlaufhalterung mit Dachprofil

Easyrail 1.33 BW, Profil A, h= 1,20m, re., VA
Easyrail 1.33 OS, profile A, h= 1,20m, right-side, chemical anchor

Part-No.: ko1515

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EN 1317-2 HI-W4-B
 ENG-00511

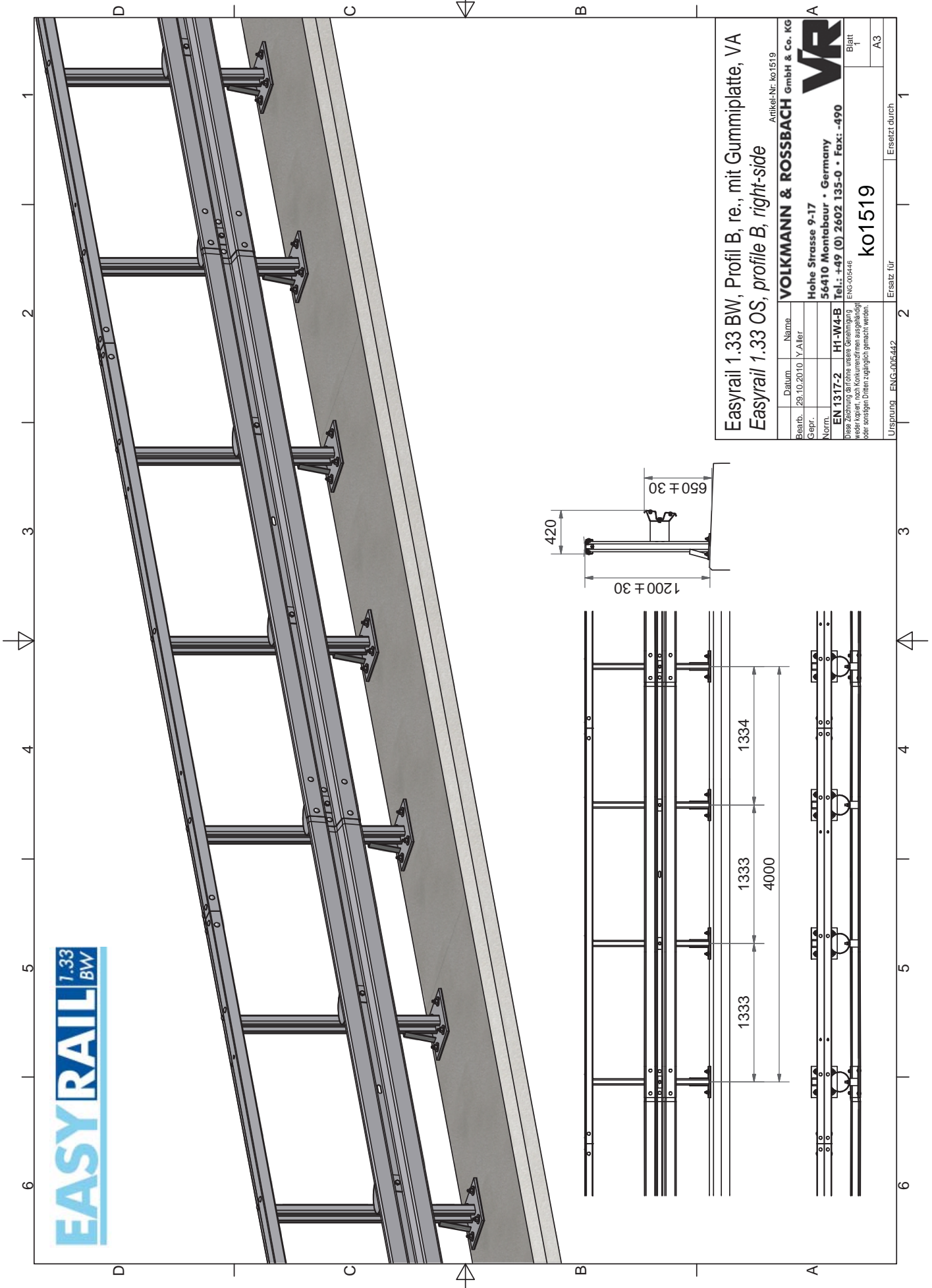
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Origin: ENG-00511

Replacement for: **ko1515**

Replaced by:

Sheet 1/2
 Rev. D



EASYRAIL
1.33
BW

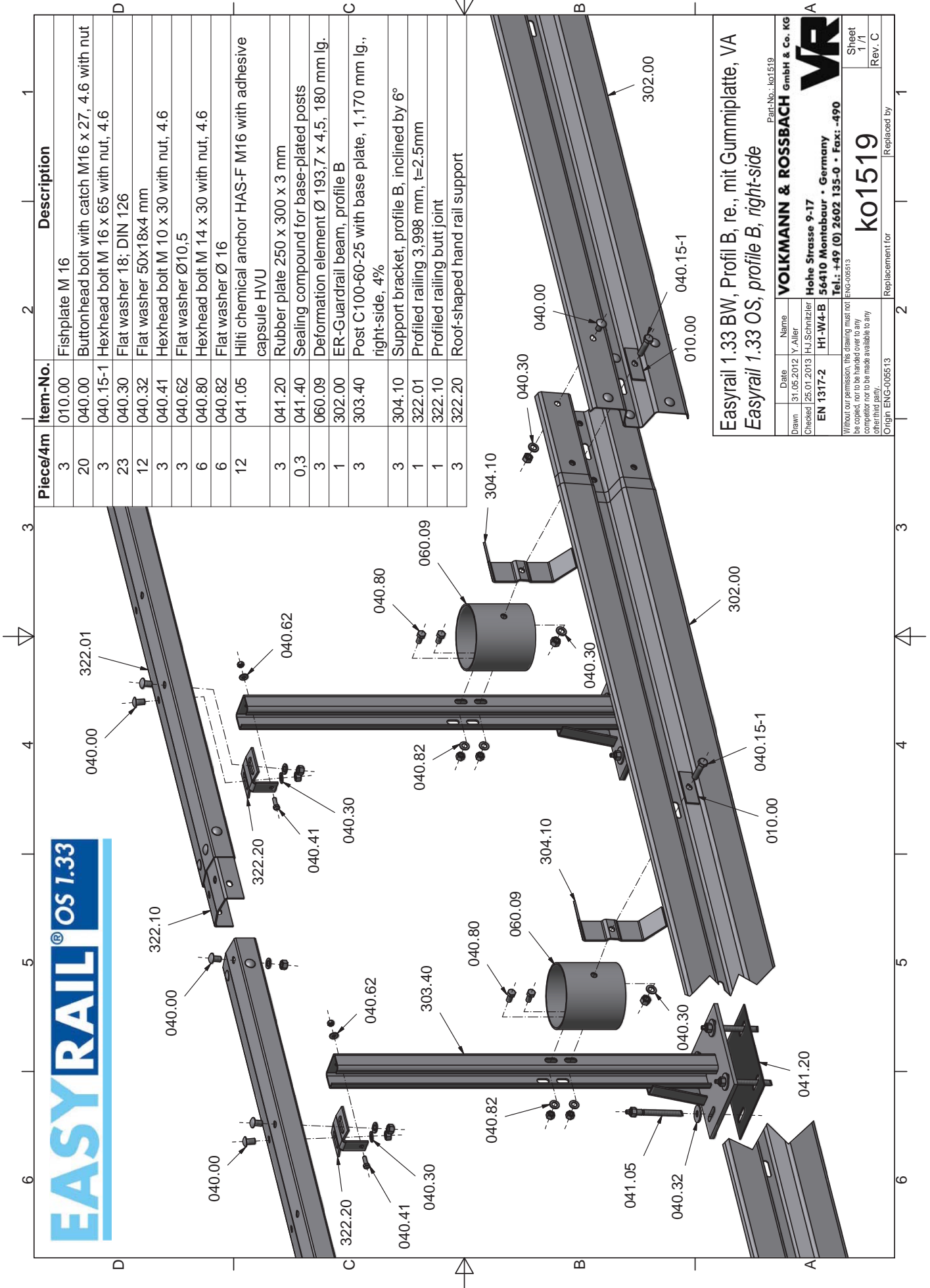
Easyrail 1.33 BW, Profil B, re., mit Gummipolster, VA
Easyrail 1.33 OS, profile B, right-side
 Artikel-Nr. ko1519

Bearb.	Datum	Name
Gepr.	29.10.2010	Y. Aler
Norm.	EN 1317-2	HI-W4-B

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 Tel.: +49 (0) 2602 135-0 • Fax: -490
 EN 1317-2 HI-W4-B
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 Ursprung: ENG-005442
 Ersatz für: ko1519
 Ersetzt durch: A3

VR
 Blatt 1

Assembly Drawing (B-Profile, Height 1.2 m)



EASYRAIL[®] OS 1.33

Piece/4m	Item-No.	Description
3	010.00	Fishplate M 16
20	040.00	Button head bolt with catch M16 x 27, 4.6 with nut
3	040.15-1	Hexhead bolt M 16 x 65 with nut, 4.6
23	040.30	Flat washer 18; DIN 126
12	040.32	Flat washer 50x18x4 mm
3	040.41	Hexhead bolt M 10 x 30 with nut, 4.6
3	040.62	Flat washer Ø10,5
6	040.80	Hexhead bolt M 14 x 30 with nut, 4.6
6	040.82	Flat washer Ø 16
12	041.05	Hilti chemical anchor HAS-F M16 with adhesive capsule HVU
3	041.20	Rubber plate 250 x 300 x 3 mm
0,3	041.40	Sealing compound for base-plated posts
3	060.09	Deformation element Ø 193,7 x 4,5, 180 mm lg.
1	302.00	ER-Guardrail beam, profile B
3	303.40	Post C100-60-25 with base plate, 1,170 mm lg., right-side, 4%
3	304.10	Support bracket, profile B, inclined by 6°
1	322.01	Profiled railing 3,998 mm, t=2.5mm
1	322.10	Profiled railing butt joint
3	322.20	Roof-shaped hand rail support

Easyrail 1.33 BW, Profil B, re., mit Gummiplatte, VA
 Easyrail 1.33 OS, profile B, right-side

Part-No.: kot1519

Drawn	31.05.2012	Y. Aller
Checked	25.01.2013	H.J. Schmitzler
EN 1317-2	HT-W4-B	

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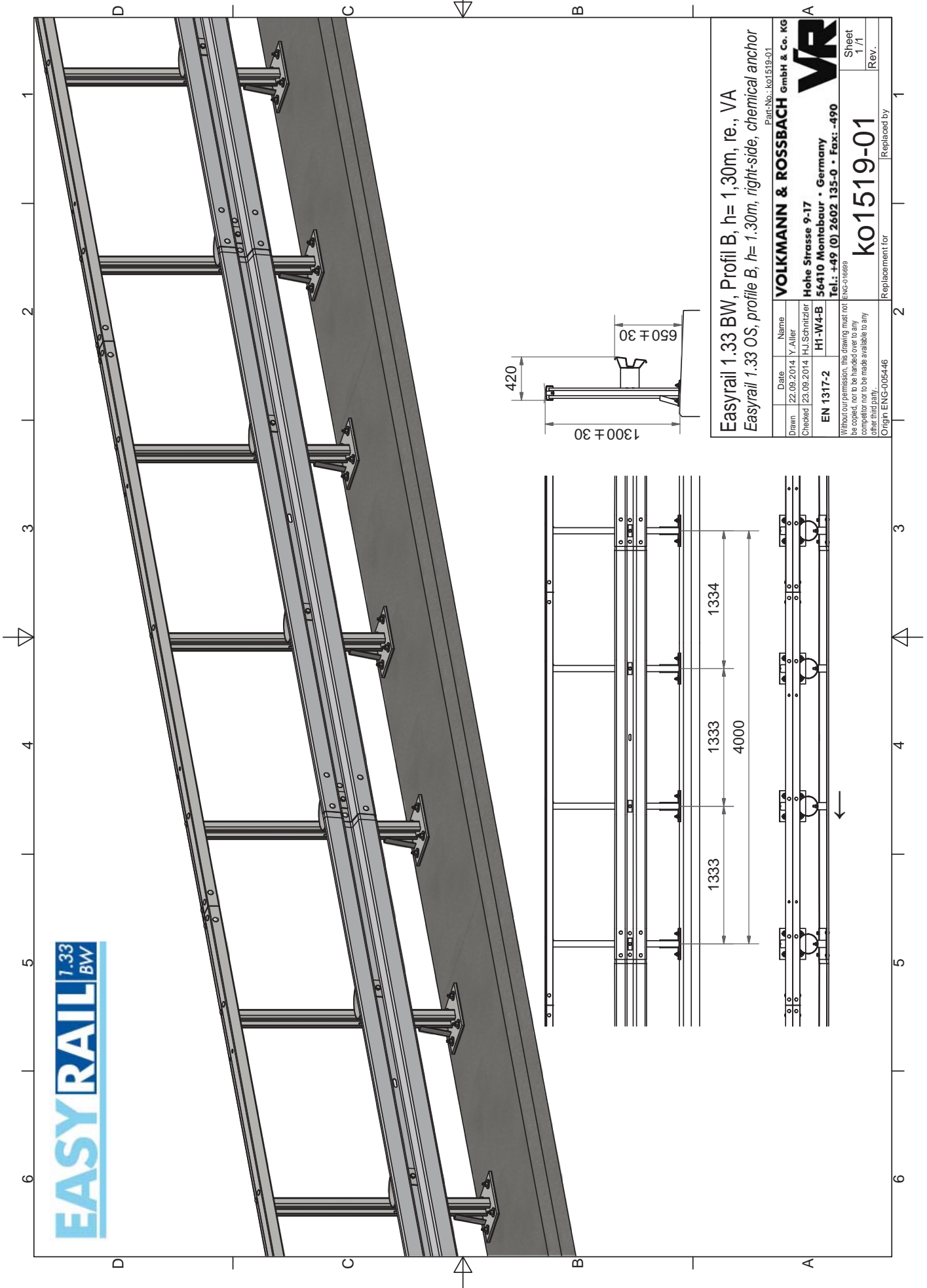
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Origin: ENG-06513

Replacement for **k01519**

Sheet 1 / 1
 Rev. C

Appendix 3 - Page 5
 System Drawing (B-Profile, Height 1.3 m)



Easyrail 1.33 BW, Profil B, h= 1,30m, re., VA
Easyrail 1.33 OS, profile B, h= 1.30m, right-side, chemical anchor
 Pat.No.: ko1519-01

Date	Name
Drawn: 22.09.2014	Y. Ailer
Checked: 23.09.2014	H.J. Schmitzler
EN 1317-2	HT-W4-B

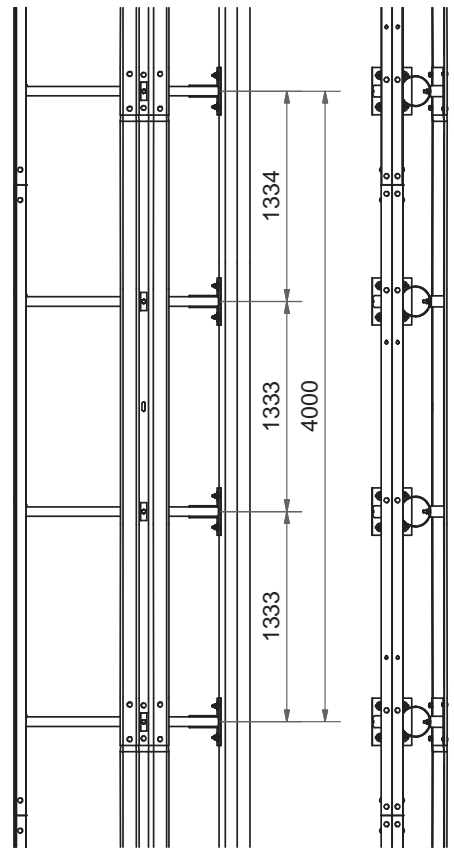
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 Origin: ENG-016699

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VR

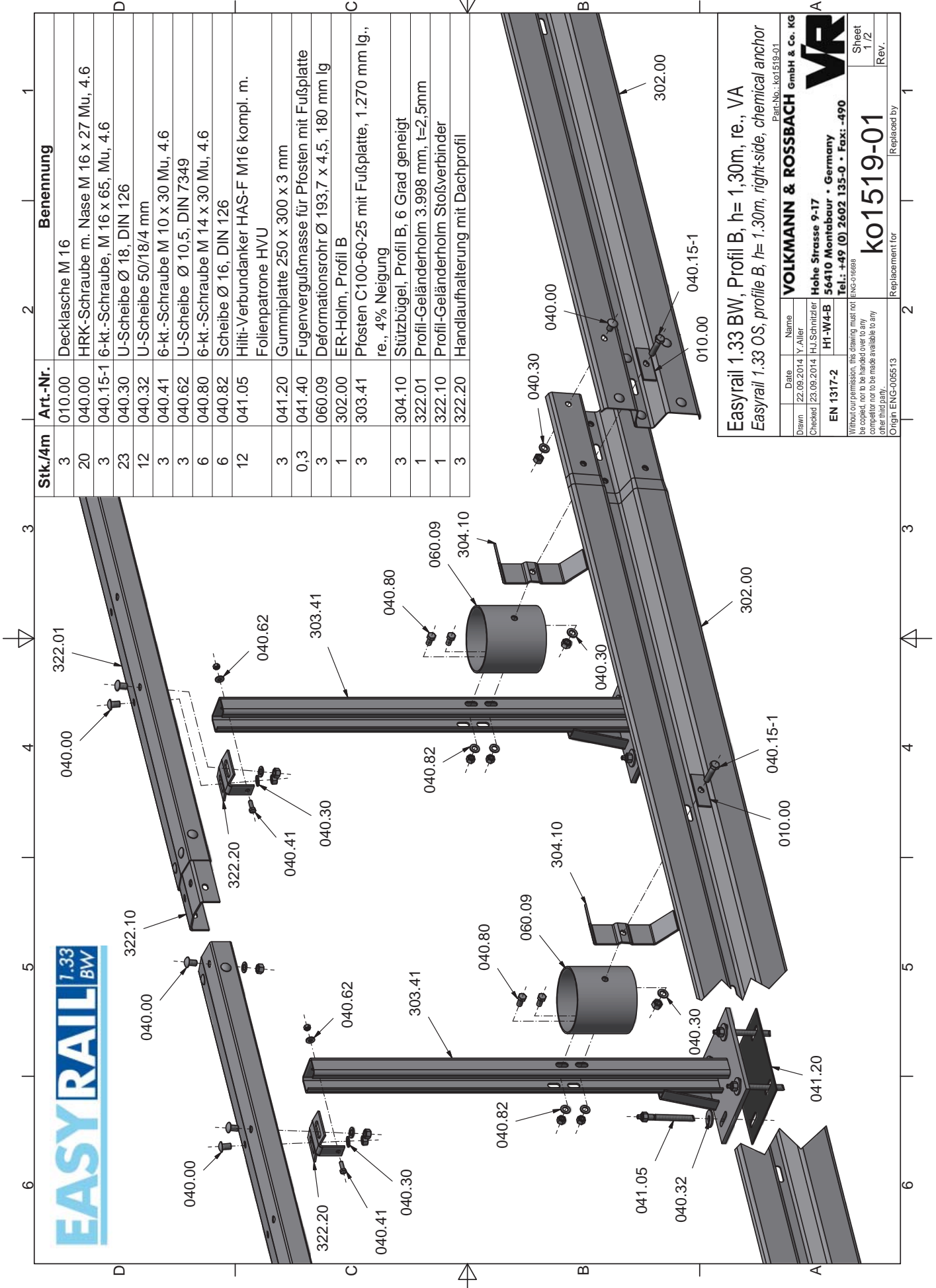
Sheet 1 / 1
 Rev.

Replacement for: ko1519-01



EASYRAIL
 1.33
 BW

Appendix 3 - Page 6
 Assembly Drawing (B-Profile, Height 1.3 m)



Stk./4m	Art.-Nr.	Benennung
3	010.00	Decklasche M 16
20	040.00	HRK-Schraube m. Nase M 16 x 27 Mu, 4.6
3	040.15-1	6-kt.-Schraube, M 16 x 65, Mu, 4.6
23	040.30	U-Scheibe Ø 18, DIN 126
12	040.32	U-Scheibe 50/18/4 mm
3	040.41	6-kt.-Schraube M 10 x 30 Mu, 4.6
3	040.62	U-Scheibe Ø 10,5, DIN 7349
6	040.80	6-kt.-Schraube M 14 x 30 Mu, 4.6
6	040.82	Scheibe Ø 16, DIN 126
12	041.05	Hilti-Verbundanker HAS-F M16 kompl. m. Folienpatrone HVU
3	041.20	Gummiplatte 250 x 300 x 3 mm
0,3	041.40	Fugenvergussmasse für Pfosten mit Fußplatte
3	060.09	Deformationsrohr Ø 193,7 x 4,5, 180 mm lg
1	302.00	ER-Holm, Profil B
3	303.41	Pfosten C100-60-25 mit Fußplatte, 1.270 mm lg., re., 4% Neigung
3	304.10	Stützbügel, Profil B, 6 Grad geneigt
1	322.01	Profil-Geländerholm 3.998 mm, t=2,5mm
1	322.10	Profil-Geländerholm Stoßverbinder
3	322.20	Handlaufhalterung mit Dachprofil

Easyrail 1.33 BW, Profil B, h= 1,30m, re., VA
Easyrail 1.33 OS, profile B, h= 1,30m, right-side, chemical anchor

Part-No.: ko1519-01

Drawn	22.09.2014	Y. Aller
Checked	23.09.2014	H.J. Schmitzler
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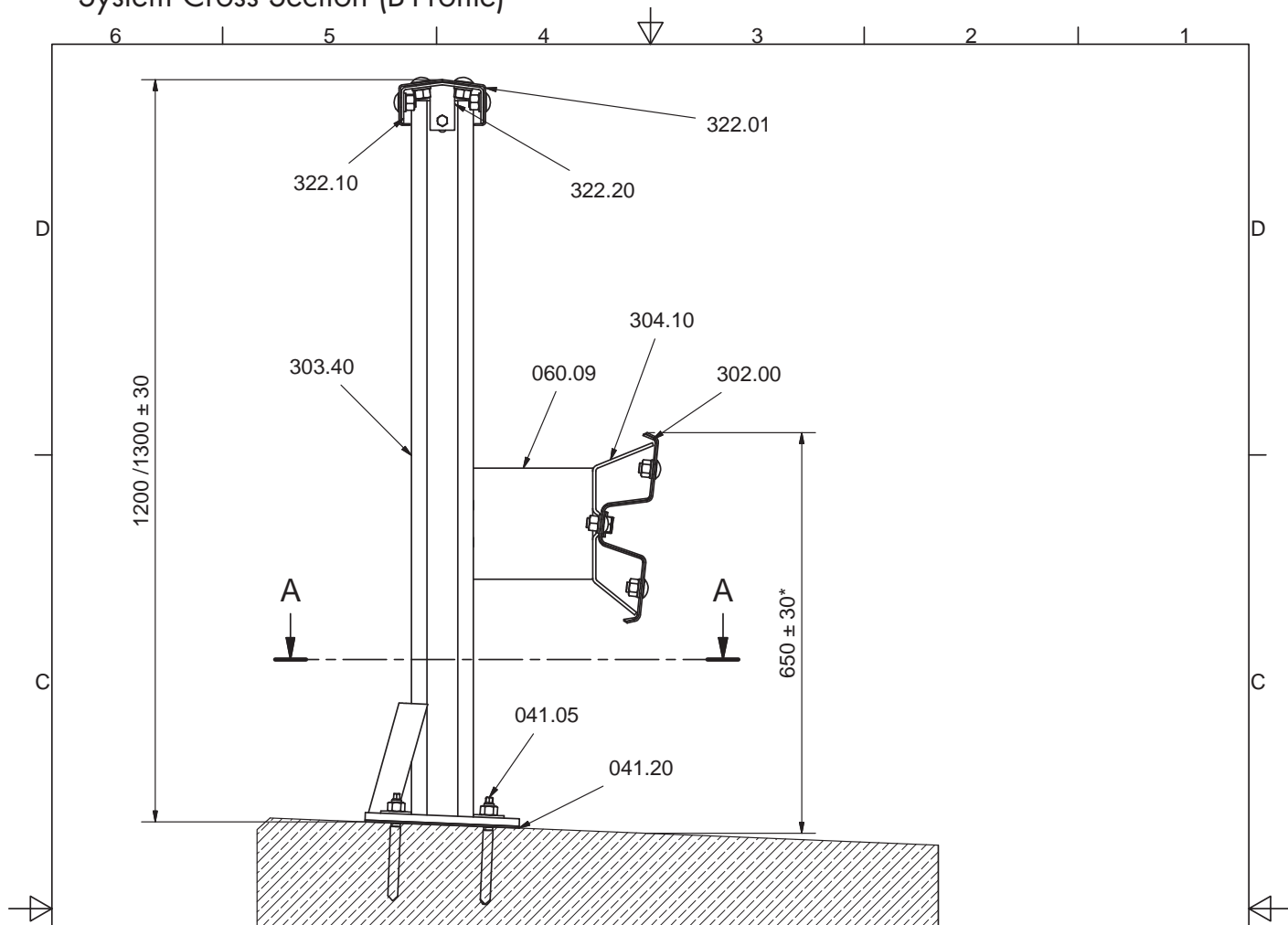
VR

Sheet 1/2
 Rev.

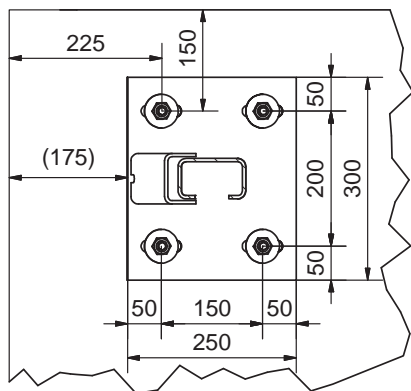
Replacement for **ko1519-01**

Origin: ENG-06513

Appendix 3 - Page 7
System Cross Section (B-Profile)



Schnitt A-A
Section A-A



Verankerung

Hilti- Verbundanker HAS-F M16 mit Folienpatrone HVU

Anchorage

Hilti chemical anchor HAS-F M16 with adhesive capsule HVU

* Die Schutzplankenhöhe wird auf Höhe der Schutzplanke und nicht auf Höhe des Pfostens gemessen.

The height of the guardrail beam is measured in the line of the beam and not in the line of the post.

ER 1.33 BW- Randabstände für Verankerung
ER 1.33 OS - Edge distances for anchorage

Part-No.: ko1519

	Date	Name
Drawn	01.03.2016	B.Homscheid
Checked	01.03.2016	HJ.Schnitzler

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ENG-022889

Sheet 1/1

Rev.

Origin

Replacement for

Replaced by

Appendix 4 - Setting Instructions for Adhesive Anchors

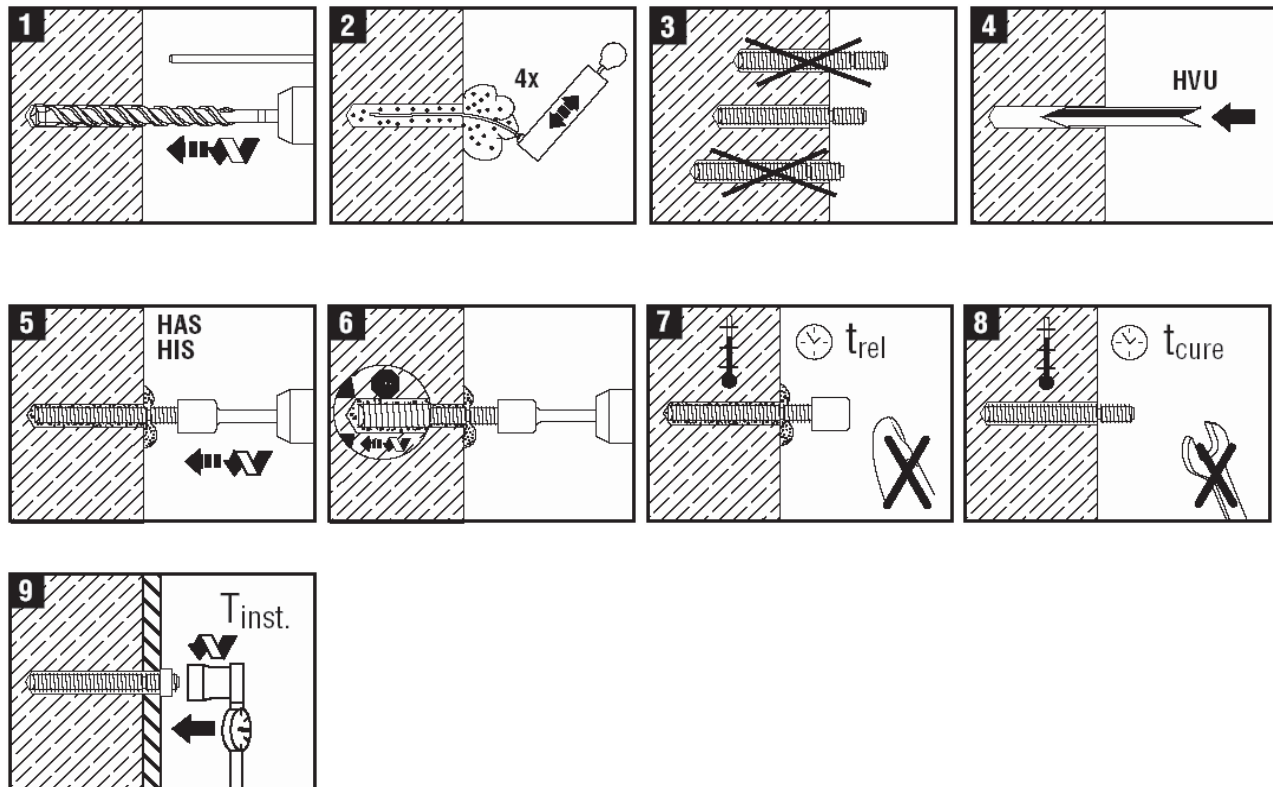


Fig. 1: Setting instructions and necessary cleaning aids (hand pump or compressed air 6 bar)

Table 6: Waiting time before application of the load¹⁾

Min. Temperature of Anchoring Ground	Waiting Time
-5°C to 0°C	5 h
0°C to 10°C	1 h
10°C to 20°C	30 min
20°C to max. 40°C	20 min

1) The waiting times specified only apply to dry anchoring ground.

HILTI HVU with HAS(-E)(-F) and HIS-N

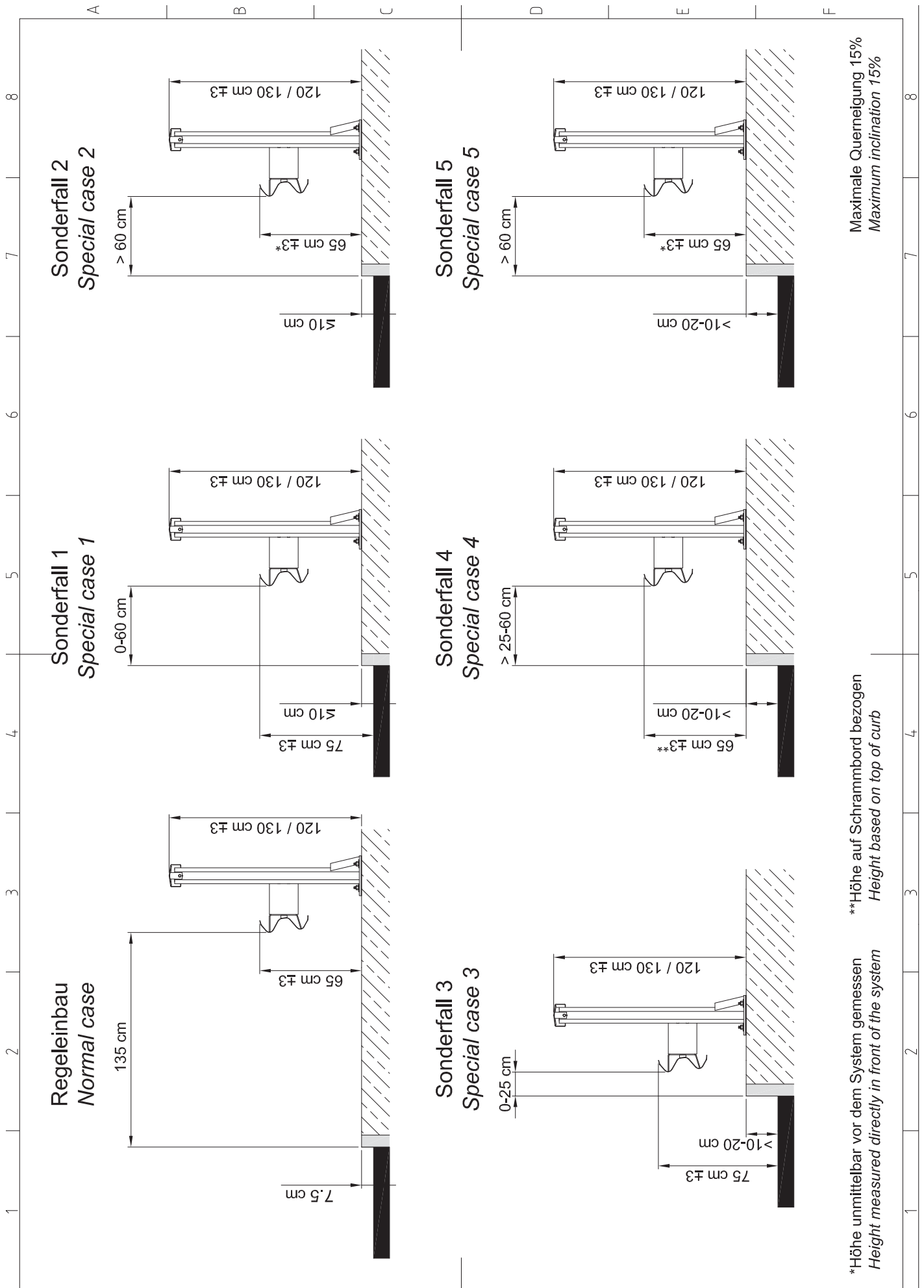
Setting Instructions and Waiting Times

Appendix 4

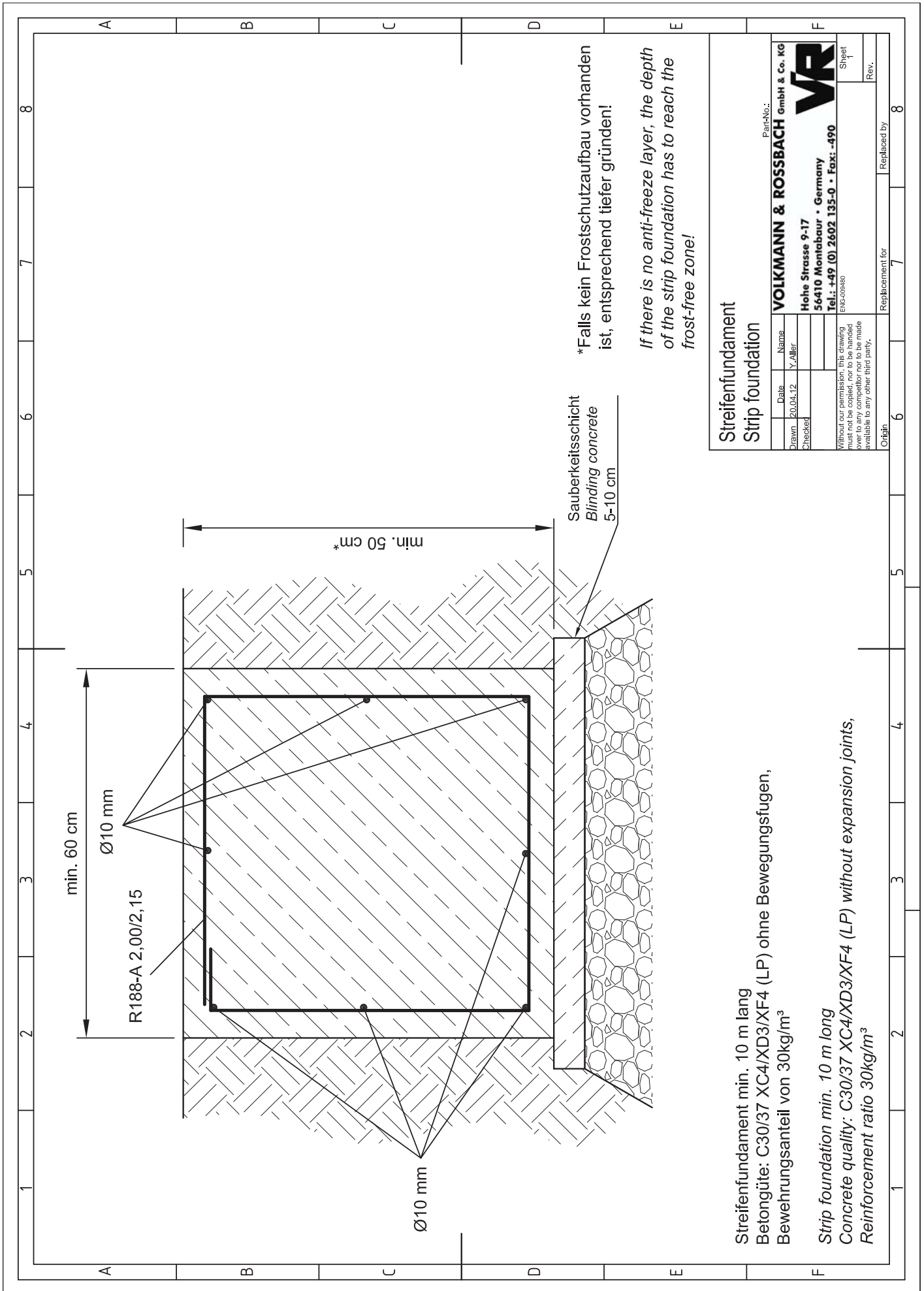
of European
Technical Approval

ETA - 05/0255

Appendix 5 - Installation Heights and Limits of Kerbs



Appendix 6 - Strip Foundation



Streifenfundament Strip foundation		Part-No.:	
Date	Name	VOIKMANN & ROSSBACH GmbH & Co. KG	
Drawn 20.04.12	Y. Allier	Hohe Strasse 9-17	
Checked		56410 Montabaur · Germany	
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Origin		ENG-009480	
Replacement for		Sheet 1	
6		7	
8		8	

Streifenfundament min. 10 m lang
 Betongüte: C30/37 XC4/XD3/XF4 (LP) ohne Bewegungsfugen,
 Bewehrungsanteil von 30kg/m³

Strip foundation min. 10 m long
 Concrete quality: C30/37 XC4/XD3/XF4 (LP) without expansion joints,
 Reinforcement ratio 30kg/m³

Self Monitoring Report – EasyRail OS

Customer	Contractor (Stamp)
Project-Nr.	
Work Site	
Vehicles	

Team Leader	Team Member 2
Team Member 3	Team Member 4
Team Member 5	Team Member 6

No.	Achievement /Product	Linear Metres	Pieces	Hours
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Consecutively use these marks: + = ok, o = not ok, - = not inspected

<input type="checkbox"/> Installation height correct in correlation to height of kerb and distance to road?	<input type="checkbox"/> All system parts installed according to manual?
<input type="checkbox"/> Closed face of posts to traffic? Post distance correct?	<input type="checkbox"/> Support brackets installed with correct orientation?
<input type="checkbox"/> All fishplates installed?	<input type="checkbox"/> All screws and washers installed? Screwing torques correct?
<input type="checkbox"/> Beam joints overlapping in direction of traffic? Overlapping 30 cm minimum (fitting parts)?	<input type="checkbox"/> Minimum distance of drilled joint holes to beam end 40 mm? Minimum diameter of drilled holes 18 mm?
<input type="checkbox"/> Minimum lengths of fitting parts 750 mm?	<input type="checkbox"/> System aligned laterally and heightwise?
<input type="checkbox"/> None of the existing holes widened?	<input type="checkbox"/> System identification stickers put (where required)?

Name and Signature Contractor	Name and Signature Customer
Place	Date

Self Monitoring Report – Anchors

Customer	Contractor (Stamp)
Project-Nr.	
Work Site	
Vehicles	

Team Leader	Team Member 2
Team Member 3	Team Member 4
Team Member 5	Team Member 6

Please use the following marks in column "TM" below: + = ok, o = not ok, - = not inspected

Tensile Test No.	Place of Installation	Test Load (min. 50kN)	TM	Note
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

A minimum of 3% of the anchors installed have to be tested. In case that faulty anchors are being found, all anchors of the posts affected as well as the two adjacent posts have to be tested. If the fault rate is >50%, all anchors on the structure have to be tested.

Faulty anchors must be replaced!

Name and Signature of the Person Responsible	Name and Signature of the Client
Place	Date