



<b>Matoro<sup>®</sup>-Drain</b>		<b>Sheet</b>
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	Product Group	Date
	<b>Hydroactive Surfaces / Seepage</b>	<b>11.03.02</b>

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<b>General Information</b> Product  Material  Design grid (see sketch 5)  Tolerances  Weight (for stone heights 80 mm and 100 mm)  Demand  Percentage of area as openings Joint filling  Marking  Quality standards  Protection rights	<b>Matoro®-Drain</b>	
	Interlocking paving with edging stones, 2/3-stones, 1/3-stones, beginning and end stones	
	Concrete	
	Main stone:	224 x 112(224) mm
	Edging stone:	224 x 112(168) mm
	2/3-stone:	224 x 112 mm
	1/3-stone:	112 x 112 mm
	Beginning and end stones:	224 x 112 mm
	Length ± 3mm	Width ± 3 mm    Height ± 5 mm
		H = 80 mm
Main stone:	about 6.3 kg	about 8.1 kg
Edging stone:	about 5.6 kg	about 7.0 kg
2/3-stone:	about 4.4 kg	about 5.5 kg
1/3-stone:	about 2.2 kg	about 2.8 kg
Beginning and end stones:	about 4.4 kg	about 5.5 kg
Main stone:	about 26 stones / m <sup>2</sup>	
Edging stone:	about 4.4 stones / m (about 31 stones / m <sup>2</sup> )	
2/3-stone:	about 3 stones / m (about 39 stones / m <sup>2</sup> )	
1/3-stone:	about 3 stones / m (about 78 stones / m <sup>2</sup> )	
Beginning and end stones:	about 4.4 stones / m (about 39 stones / m <sup>2</sup> )	
	about 8.5% per m <sup>2</sup> (for 5 mm joint width)	
	for stone height 100 mm:	about 0.0085 m <sup>3</sup> /m <sup>2</sup>
	for stone height 80 mm:	about 0.0068 m <sup>3</sup> /m <sup>2</sup>
	"S"-marking on one stone per production unit (depending on manufacturer)	
	according to DIN 18501, paving stones made of concrete (issue 11/82) according to EN/DIN 1338 (expected in 2002/2003) for public and commercial traffic surfaces of the classes K, D, H, Y	
	Patents such as Matoro Matoro is a registered trade mark of SF-Kooperation GmbH	
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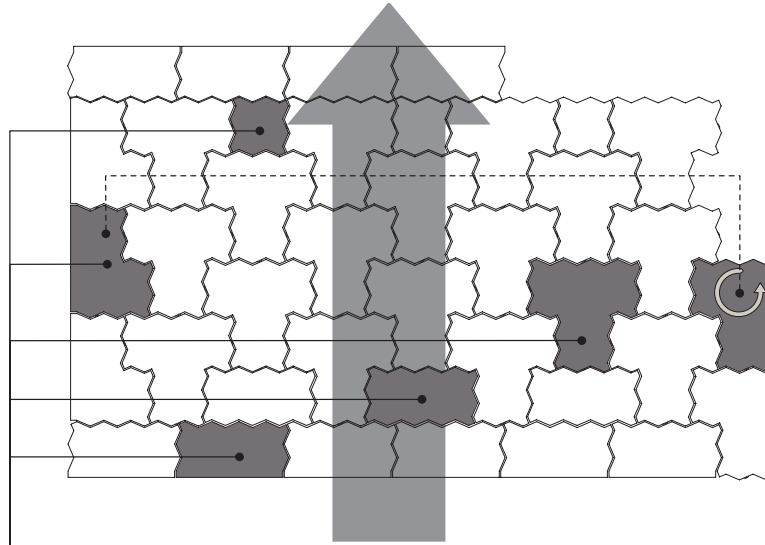
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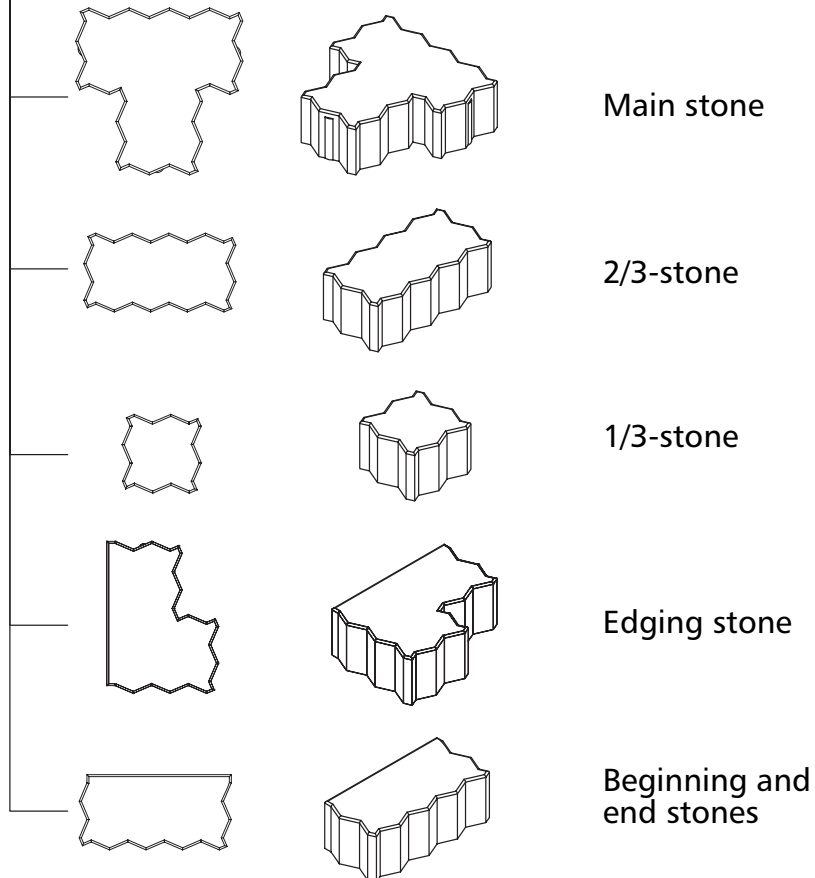


System solution

# Matoro-Drain<sup>®</sup>



Sketch 1

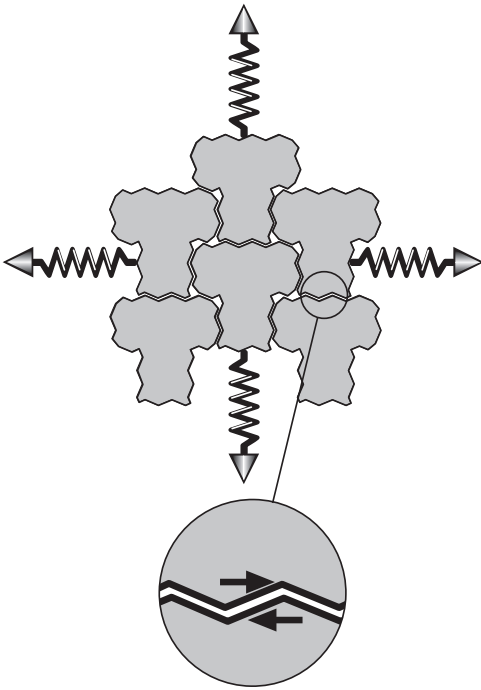


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<p>Product description</p> <p>Limits to its use</p> <p>Two-dimensional interlocking effect</p> <p>Sketch 2</p>	<h1 style="text-align: center;">Matoro-<sup>®</sup>Drain</h1> <p>Drainage paving with two-dimensional interlocking; also between the individual laying units!</p> <p>Matoro-Drain was developed from the well-known Matoro interlocking paving. 5 mm-wide joints and drainage openings at four corners of the main stone give a surface with a drainage capability and a stable, two-dimensional interlocking effect. The combination with Matoro-T and the complementary stones from the Matoro programme is provided for. Matoro-Drain is eminently suitable for machine laying.</p> <p>Matoro-Drain paving offers a complete program of individual stones as shown in Sketch 1 on sheet 3. A comprehensive system solution can therefore be implemented.</p> <p>...“To largely exclude the risk of contaminating the groundwater, these types of construction can only be used for traffic areas with low traffic loading (roadways, parking lots, parking places) and therefore with low contamination of the rainwater falling on them, also for the building classes V and VI, footpaths and bicycle ways according to the German RStO regulation and for corresponding private traffic areas.” (from the "Explanatory leaflet on water-permeable paving of traffic areas", Edition 1998, FGSV No. 947)</p> <div style="text-align: center;">  <p><b>Two-dimensional Interlocking Effect!</b></p> <p><i>Each stone lies in a secure matrix lengthways and transverse to the line of the road.</i></p> </div>	
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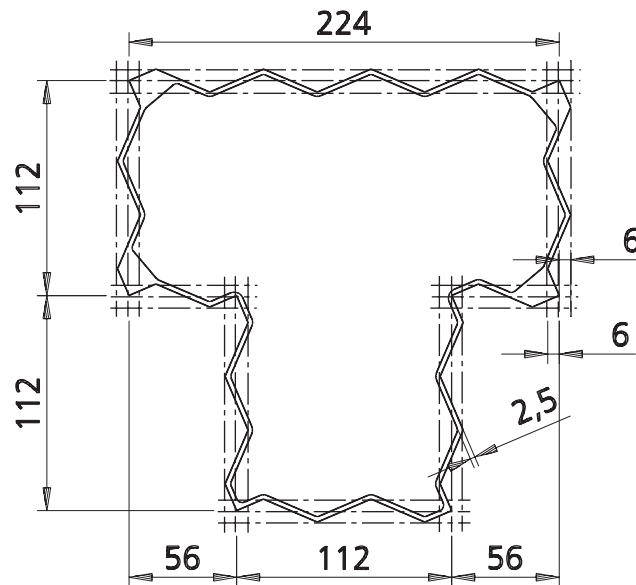


# Matoro-<sup>®</sup>Drain

All dimensions in mm

Design grid

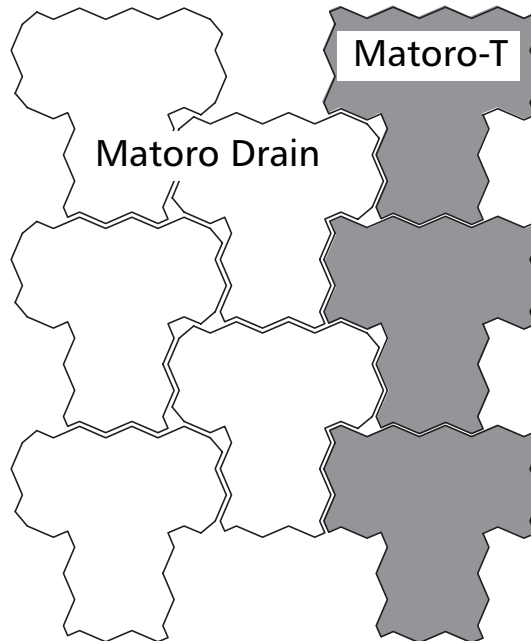
Sketch 3



The design of Matoro-Drain was based on the grid of the Matoro-T stone. A combination of both products is therefore provided for.

Combination of Matoro-T and Matoro-Drain

Sketch 4



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Product

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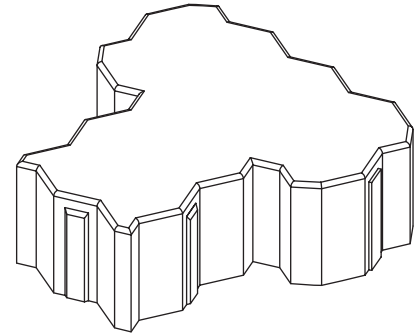
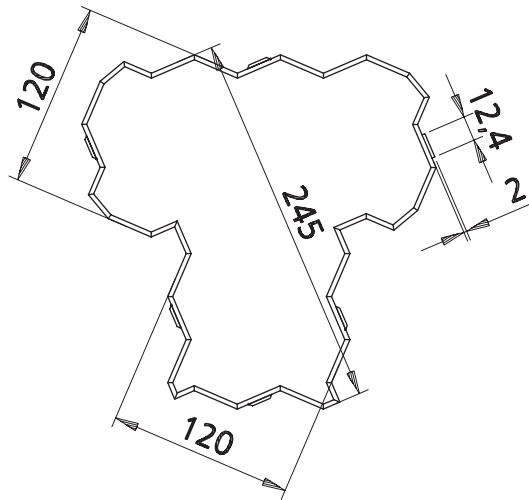
# Matoro-Drain<sup>®</sup>

All dimensions in mm

**Individual stones**  
(stone heights: 80 or 100 mm)

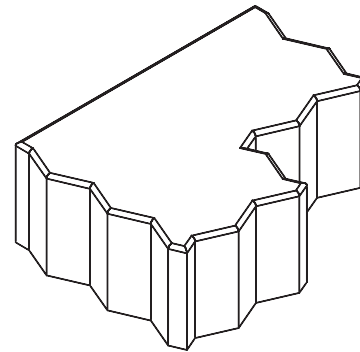
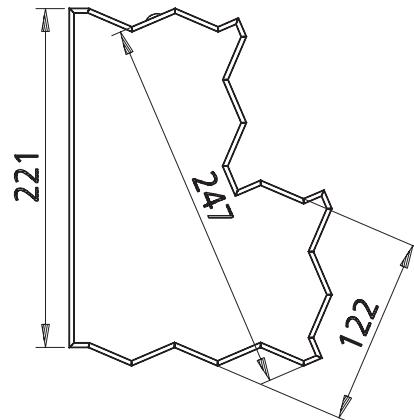
**Main stone Dimensions**

Sketch 5



**Edging stone Dimensions**

Sketch 6



Dimensioned drawings of the products are available for the construction of the molds.

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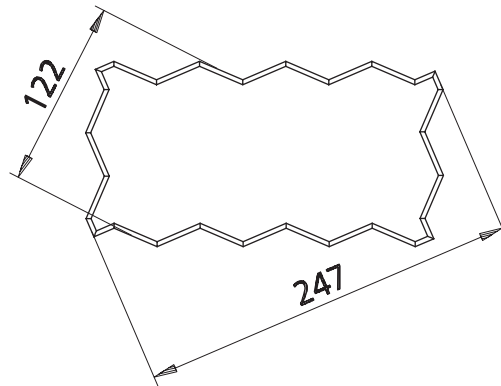
# Matoro-Drain<sup>®</sup>

All dimensions in mm

Individual stones

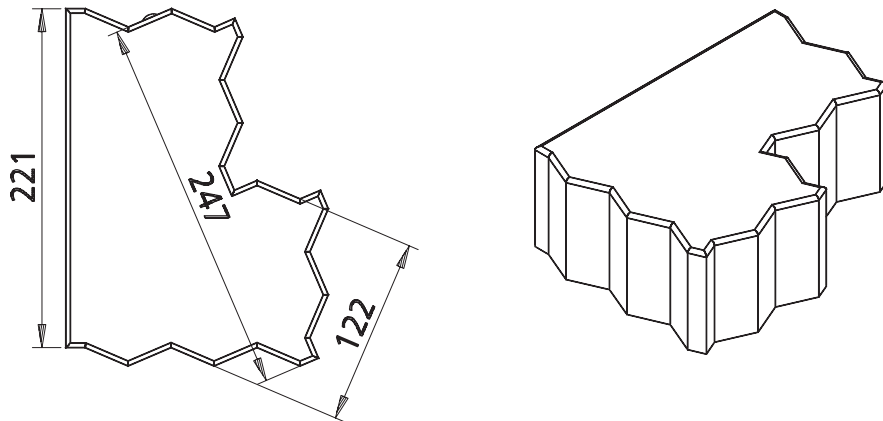
2/3-stone Dimensions

Sketch 7



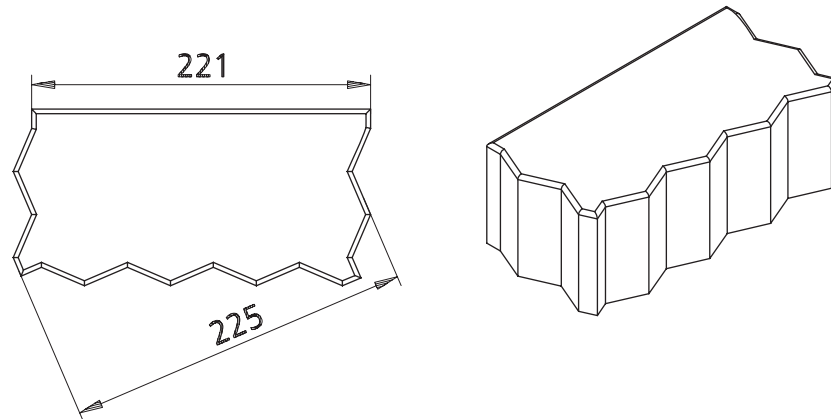
1/3-stone Dimensions

Sketch 8



Beginning and end stones Dimensions

Sketch 9



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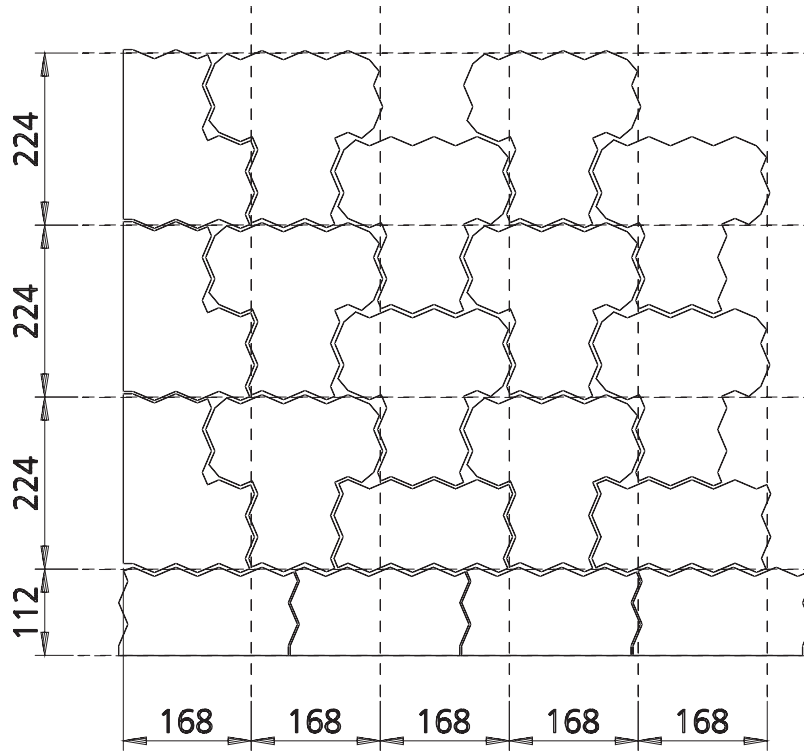
# Matoro-Drain<sup>®</sup>

All dimensions in mm

Grid

Grid dimensions

Sketch 10



Sketch 10 shows the grid dimensions of an area laid with Matoro-Drain.

The dimensioning of grid drawings spans the distance from joint centerline to joint centerline. The joint width is approx. 5 mm for this product.

Matoro Drain was so designed that complementary stones from the Matoro program can be used in laying an area.

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Product

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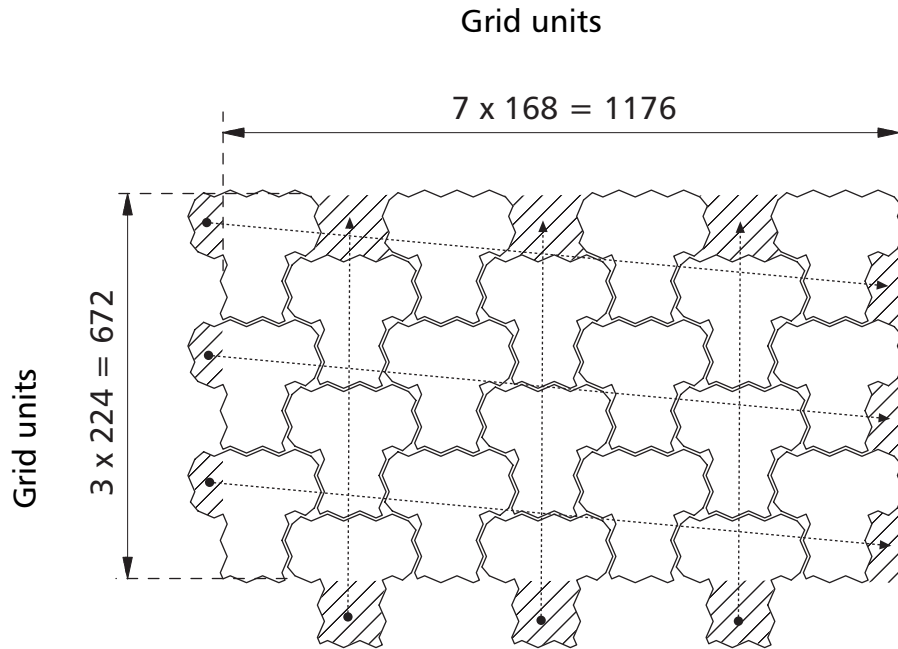
# Matoro-Drain<sup>®</sup>

All dimensions in mm

Laying

Laying units  
(21 stones)

Sketch 11



The laying unit shown in Sketch 11 is manufactured with a mold rented from SF-Kooperation GmbH.

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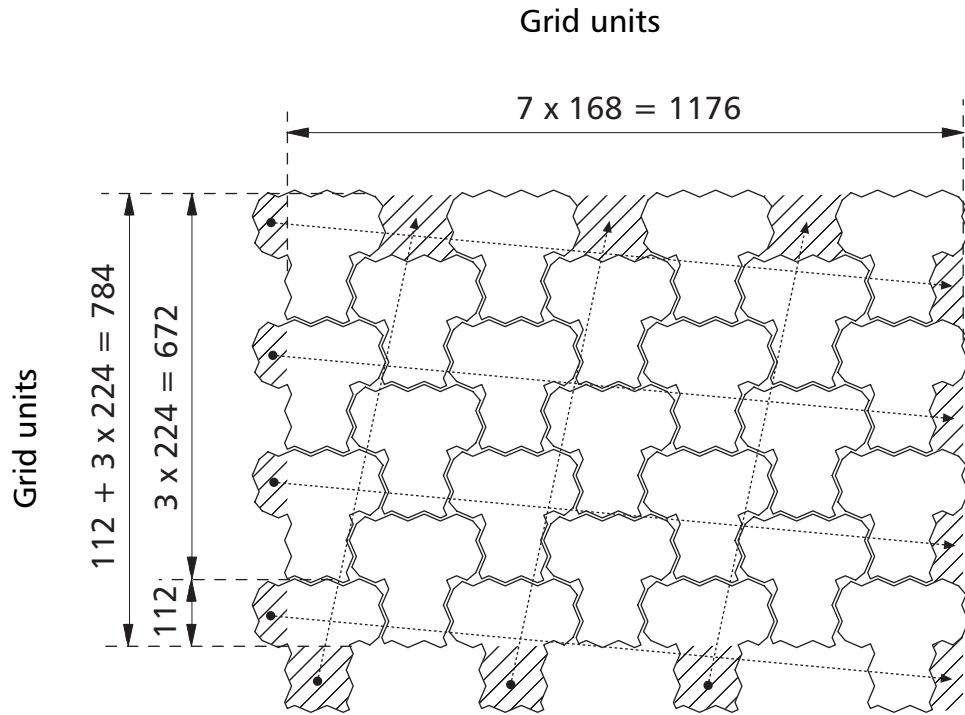
# Matoro-Drain<sup>®</sup>

All dimensions in mm

Laying

Alternative Laying units (25 stones)

Sketch 12



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Product

Matoro Drain

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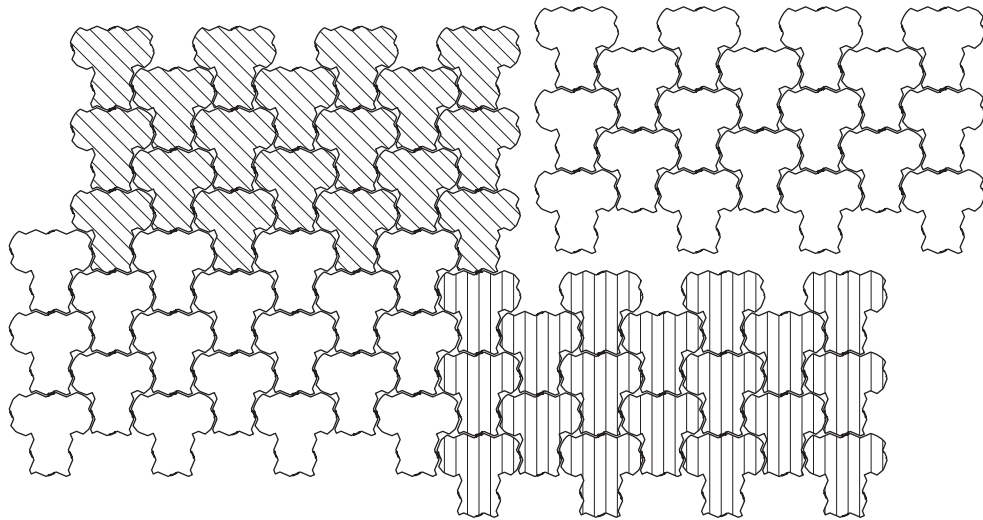


# Matoro-Drain<sup>®</sup>

Laying  
(example of  
a laying unit  
with  
18 stones)

Interlocking  
effect  
between the  
individual  
laying units

Sketch 13

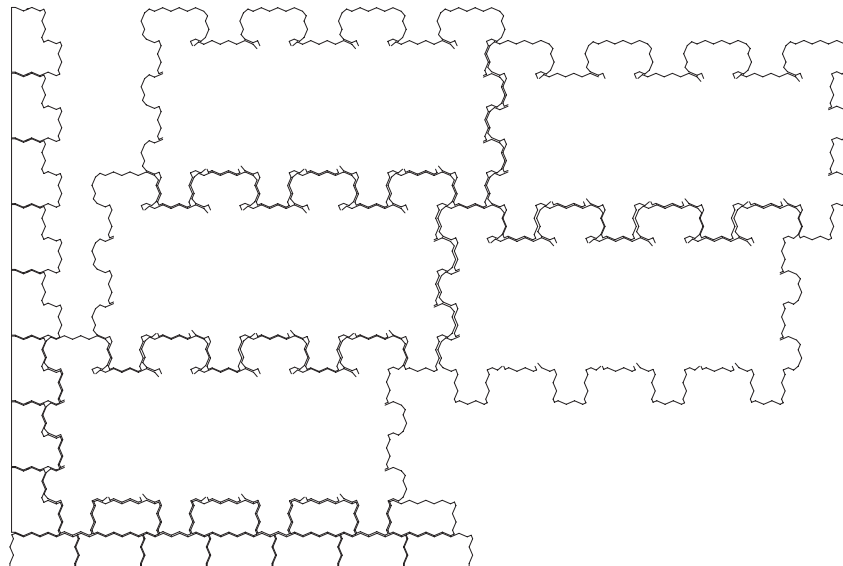
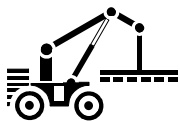


It can be seen in Sketch 13 that with the Matoro-Drain product, the interlocking effect is also provided between the individual laying units. There are therefore no "continuous joints" that would decrease the stability of the overall area or make it look less attractive.

Laying the  
individual  
units

Matoro-Drain laying units cannot be laid butted one on to the other, but have to be meshed in each other. In this way, the interlocking effect extends over the limits of the individual laying unit to the entire area.

Sketch 14



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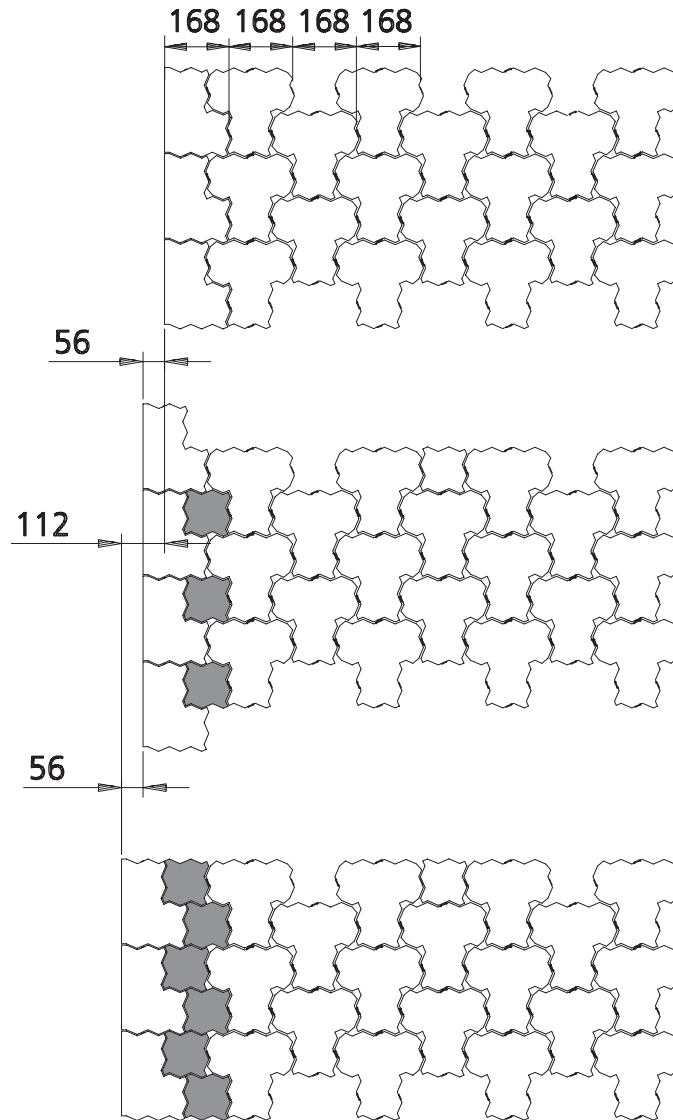
# Matoro-Drain<sup>®</sup>

All dimensions in mm

Laying

Border

Sketch 15



To reduce the time-consuming cutting in the border area of a paving surface, Matoro-Drain can be laid with a very small grid size of 56 mm by adding 1/3-stones at the edge.

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Product

Matoro Drain

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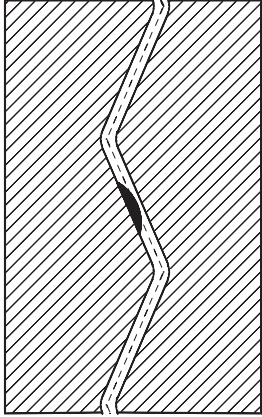
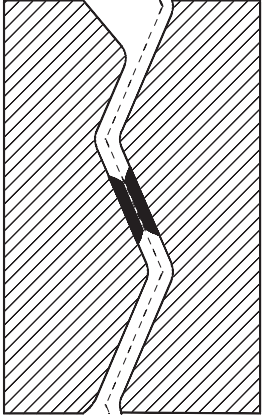
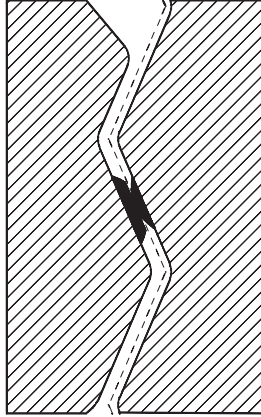
Product Group

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Date

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<p>Laying</p> <p>Joint schematic</p> <p>Sketch 16</p>	<h2 style="text-align: center;">Matoro<sup>®</sup>-Drain</h2> <div style="display: flex; justify-content: space-around; text-align: center;"> <div data-bbox="411 383 673 945"> <p>Matoro</p>  <p>Joint width 3 mm</p> </div> <div data-bbox="751 383 1013 945"> <p>Matoro-Drain</p>  <p>Joint width 5 mm</p> </div> <div data-bbox="1106 383 1367 945"> <p>Combination of Matoro-Drain and Matoro</p>  <p>Joint width 4 mm</p> </div> </div> <p>Enlarged joint cut-outs are shown in Sketch 16. By altering the spacers and reducing the manufacturing sizes, a larger joint width can be assured when laying Matoro-Drain. It can equally be seen that a combination of the products Matoro and Matoro-Drain is also made possible by dressing the spacers.</p>	
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Sales arguments	<p style="text-align: center;"><b>Matoro-<sup>®</sup>Drain</b></p> <p style="text-align: center;"><b>Marketing aids</b></p> <p><b>Eco-paving with interlocking effect</b> Matoro-Drain is a T-shaped interlocking paving stone for drainage pavers with drainage openings at the four corners of the stone and increased joint widths that can be filled with 1/3-mm gravel, so allowing water to pass through.</p> <p><b>Interlocking effect in two directions: Positional stability</b> Matoro-Drain is an interlocking paving stone with two-dimensional interlocking effect. The interlocking works in such a way that the individual stones do not even shift, rotate or tilt when heavy vehicles roll over them; they simply remain stable in position.</p> <p><b>Interlocking effect over the entire paved area</b> With Matoro-Drain, there is not only an interlocking effect between the stones within a unit but also an effect between the units themselves over the whole paved area from edge to edge. This interlocking effect is only possible because because the laying units contain no part-stones.</p> <p><b>Laying units conforming to standards contain no part-stones</b> Matoro-Drain laying units contain no part-stones; only main stones – and only such units meet the standard (VOB Part C / DIN 18318). Because of this, Matoro-Drain laying units differ from previously known formations.</p> <p><b>Machine-laying and with versatile and interlocking facilities</b> Matoro-Drain laying units cannot be laid butted one on to the other, but have to be meshed into each other during the laying. An additional manual adjustment afterwards of the laid formations, e.g. by replacing or rotating of individual stones, as recommended for other products, is not necessary.</p>	
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Sales arguments	<p style="text-align: center;"><b>Matoro<sup>®</sup>-Drain</b></p> <p style="text-align: center;"><b>Marketing aids</b></p> <p><b>Trouble-free laying</b> So that the machine-laying works as quickly and smoothly as possible, there are no spacers on the outer edge of the units. This means that Matoro-Drain units can be laid quickly and without trouble.</p> <p><b>System solution with edging and complementary stones</b> Edging blocks, beginning and end stones as well as 1/3 and 2/3-stones to match the Matoro-Drain main stone are available to cater for special solutions and extensions.</p> <p><b>Uncomplicated form philosophy – clear-cut paving appearance</b> Matoro-Drain's uncomplicated T-shape produces paving with a clear, structured, orderly appearance.</p> <p><b>Low-noise surface</b> Because of Matoro-Drain's geometry, all vehicles travel diagonally over the bed joint. This produces less rolling noise than when traveling transverse to the bed joint. Also because of the chamfer, specially adapted for the area of application, hardly any rolling noise occurs with Matoro-Drain – regardless of whether from automobiles on parking lots, trucks on the forecourts of transport companies or shopping carts at supermarkets.</p> <p><b>Combination possibilities with Matoro-T</b> Matoro-Drain can be combined with Matoro-T without any problem: Both stones are laid using the same grid size. Matoro-T is an interlocking paving stone with two-dimensional interlocking effect for standard paving.</p>	
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 D-28703 Bremen



Safety and Health Notes	<h1>Matoro-<sup>®</sup>Drain</h1> <h2>Notes regarding safety and health protection</h2> <p>When laying Matoro Drain always observe the stipulations of the "Arbeitsschutzgesetz" [worker safety law] and the "Verordnung über Sicherheit und Gesundheitsschutz auf Baustellen" [Ordinance on Safety and Health Protection on Construction Sites].</p> <p>This also includes implementation of the EEC Directive 90/269/EEC with regard to safety and health protection during manual handling of loads.</p> <p>Also applicable is "Beurteilung von Lasthandhabungen anhand von Leitmerkmalen" [Judging Load Handling Work on the Basis of Certain Characteristics] according to "Handlungsanleitung zur Beurteilung der Arbeitsbedingungen beim Heben und Tragen von Lasten, LV9, des Länderausschusses für Arbeitsschutz und Sicherheitstechnik" [Instructions for Judging Working Conditions During Lifting and Carrying of Loads, LV9, of the Regional Committee for Worker Protection and Safety Mechanisms]:</p>																																																												
	<table border="1"> <thead> <tr> <th>Time-weighting</th> <th>Regular repetition of short lifting and moving procedures</th> <th>Work in m<sup>2</sup></th> <th>Continuous carrying or holding over long periods of time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>&lt; 10 times per shift</td> <td>up to 0.4 m<sup>2</sup></td> <td>Total duration &lt; 30 min.</td> </tr> <tr> <td>2</td> <td>10 to &lt; 40 times per shift</td> <td>up to 1.5 m<sup>2</sup></td> <td>Total duration 30 min. to &lt; 1 hr.</td> </tr> <tr> <td>4</td> <td>40 to &lt; 200 times per shift</td> <td>up to 7.7 m<sup>2</sup></td> <td>Total duration 1 hr. to &lt; 3 hr.</td> </tr> <tr> <td>5</td> <td>200 to &lt; 500 times per shift</td> <td>up to 19 m<sup>2</sup></td> <td>Total duration 3 hr. to &lt; 5 hr.</td> </tr> <tr> <td>6</td> <td>≥ 500 times per shift</td> <td>from 19 m<sup>2</sup></td> <td>Total duration ≥ 5 hr.</td> </tr> </tbody> </table>	Time-weighting	Regular repetition of short lifting and moving procedures	Work in m <sup>2</sup>	Continuous carrying or holding over long periods of time	1	< 10 times per shift	up to 0.4 m <sup>2</sup>	Total duration < 30 min.	2	10 to < 40 times per shift	up to 1.5 m <sup>2</sup>	Total duration 30 min. to < 1 hr.	4	40 to < 200 times per shift	up to 7.7 m <sup>2</sup>	Total duration 1 hr. to < 3 hr.	5	200 to < 500 times per shift	up to 19 m <sup>2</sup>	Total duration 3 hr. to < 5 hr.	6	≥ 500 times per shift	from 19 m <sup>2</sup>	Total duration ≥ 5 hr.	<table border="1"> <thead> <tr> <th>Load-weighting</th> <th>Posture-weighting</th> <th>Execution-weighting</th> <th>Σ 1 - 3</th> <th>x Time-weighting</th> <th>Point value</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4</td> <td>0</td> <td>5</td> <td>6</td> <td>30</td> </tr> <tr> <td>1</td> <td>4</td> <td>0</td> <td>5</td> <td>5</td> <td>25</td> </tr> <tr> <td>1</td> <td>4</td> <td>0</td> <td>5</td> <td>4</td> <td>20</td> </tr> <tr> <td>1</td> <td>4</td> <td>0</td> <td>5</td> <td>2</td> <td>10</td> </tr> <tr> <td>1</td> <td>4</td> <td>0</td> <td>5</td> <td>1</td> <td>5</td> </tr> </tbody> </table>	Load-weighting	Posture-weighting	Execution-weighting	Σ 1 - 3	x Time-weighting	Point value	1	4	0	5	6	30	1	4	0	5	5	25	1	4	0	5	4	20	1	4	0	5	2	10	1	4	0	5	1
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	<p><b>Result:</b></p> <p><i>Point value 30 and 25:</i> Considerably elevated strain, possibility of bodily over-exertion even for normally resilient persons. Measures to conform are recommended.</p> <p><i>Point value 20 and 10:</i> Elevated strain, possibility of over-exertion for persons of diminished resiliency. Measures to conform are advisable for persons in this category.</p> <p><i>Point value 5:</i> Minimal strain, danger to health due to bodily over-exertion is unlikely. In general, laying should be done by machine wherever possible.</p>																																																												
	Product	Sheet																																																											
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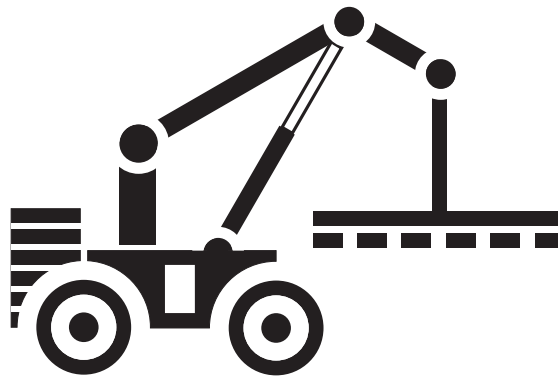
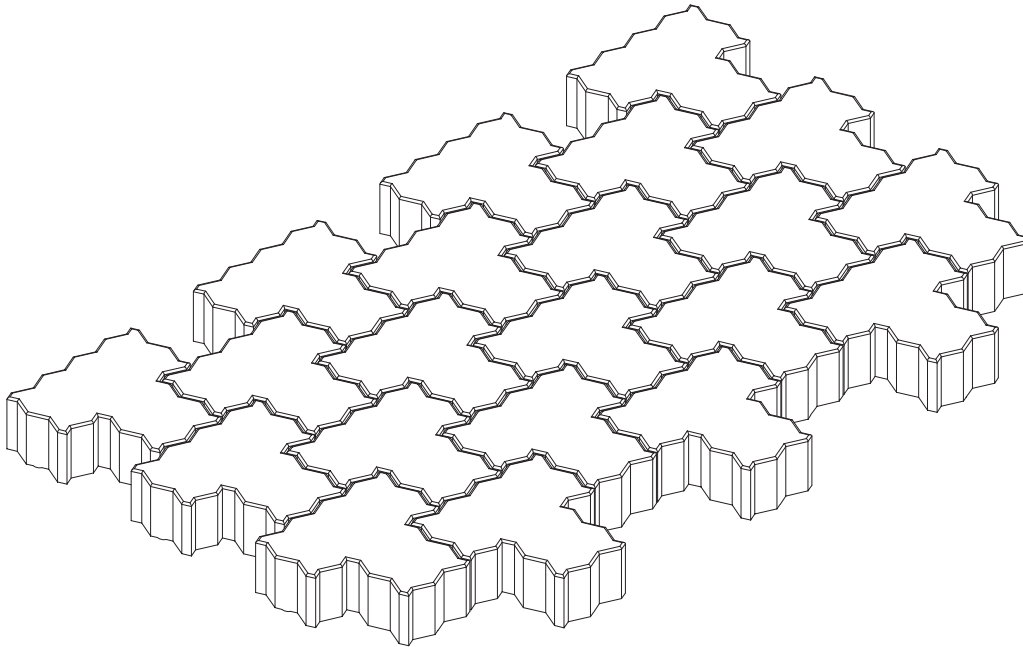
<p><b>References</b> Standards, Specifications, Rules</p>	<h1 style="text-align: center;">Matoro<sup>®</sup>-Drain</h1> <p>RStO 86 - Guidelines for the standardization of pavements for traffic areas, issue 1986, supplementary edition 1989; FGSV 990 under revision.  <b>ZTVT-StB 95/98</b> – Supplemental technical contractual conditions and guidelines for road construction subbases, edition 1998; FGSV 999  <b>ZTVE-StB 94</b> – Supplemental technical contractual conditions and guidelines for road construction earthwork, edition 1994; FGSV 599  <b>TL Min-StB 2000</b> – Technical delivery conditions for mineral aggregates in road construction, edition 2000</p> <p><b>VOB part C:</b>General technical contract conditions for building works (ATV), traffic route building activities - pavement surfaces, slabstone paving, curbs --<b>DIN 18318</b>, version December 2000  <b>ZTVP-StB 2000</b> – Supplemental technical contract conditions and guidelines for the construction of pavement surfaces and slabstone paving, version 2000, FGSV 699  <b>LasthandhabV</b> - [manual load handling ordinance] - Ordinance about safety and health protection during manual handling of loads during work (manual load handling ordinance) edition 1996.  <b>DIN 483 (08/81)</b> Concrete curb stones  <b>DIN 485 (04/87)</b> Concrete sidewalk slabs  <b>DIN 18 501 (11/82)</b> Concrete paving stones  <b>Code of practice</b> about the slip resistance of pavement and slabstone paving for pedestrian traffic; edition 1997; FGSV 407  <b>Fundamentals for durable paving surfaces</b>, proper installation of concrete paving stones; with video, edition 01/1997 (currently out of print, will be updated).  <b>RAS-Ew</b> Guidelines for the layout of streets, part: Drainage RAS-Ew, Edition 06.87, FGSV 539  <b>Code of practice</b> for water-permeable paving of traffic surfaces; edition 1998, FGSV No. 947  <b>ATV Worksheet A 138</b> - Planning, construction and operation plants for the seepage of rainwater, ATV-DVWK, edition January 2002  <b>Code of practice ATV-DVWK-M 153</b> --Recommendations for handling rain water, edition 02.2000  <b>DIN 1986-2</b> Drainage facilities for buildings and properties, edition 03.95  <b>Rainwater tests 'Matoro-Drain'</b>, Brandenburg Technical University, Cottbus  <b>Seepage in paved traffic surfaces</b> Planning possibilities for the use of water-permeable paving systems, with video, edition 06/1996, SF-Kooperation GmbH</p>	
	Product	Sheet
	Matoro Drain	17 of 17
<small>Datenblatt-Matoro-Draen.fm Freeseemann / Köster</small>	Product Group	Date
	Hydroactive Surfaces / Seepage	11.03.02

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# Matoro-Drain<sup>®</sup>



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