

# PMT PROJECT REPORT

FVE FRÝDLANT NAD OSTRAVICÍ KOTELNA

23TG108

SYSTEM SIZE: 93.84 KWP

11/9/2023

Efektivní dum s.r.o.



NEXT LEVEL  
MOUNTING

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## PROJECT DATA

This project report is based on the project data provided by the client. The data given in the project report must be compared with the building and module data on site. In the event of discrepancies, this must be agreed with your responsible planning partner and the planning has to be adjusted.

## PROJECT CHANGES / ADJUSTMENTS

Changes and adjustments to the project may result in different static requirements and material quantities. Any changes and adjustments include, but are not limited to, changes in module size and module weight, changes in module array arrangement and building parameters. Any change requires a recalculation of the design.

## DOWNLOAD AREA

<http://pmt.solutions/downloads>



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## MASTER DATA

Project Name	FVE Frýdlant nad Ostravicí Kotelna
Comment	
Planning Responsible	Ing. David Mamula
Software v.:	11.0.14.24452
Amount Modules	204
System Size	93.84 kWp
Orientation [°]	163.4
Roofpitch [°]	2
Allocated Area	441.85 m²

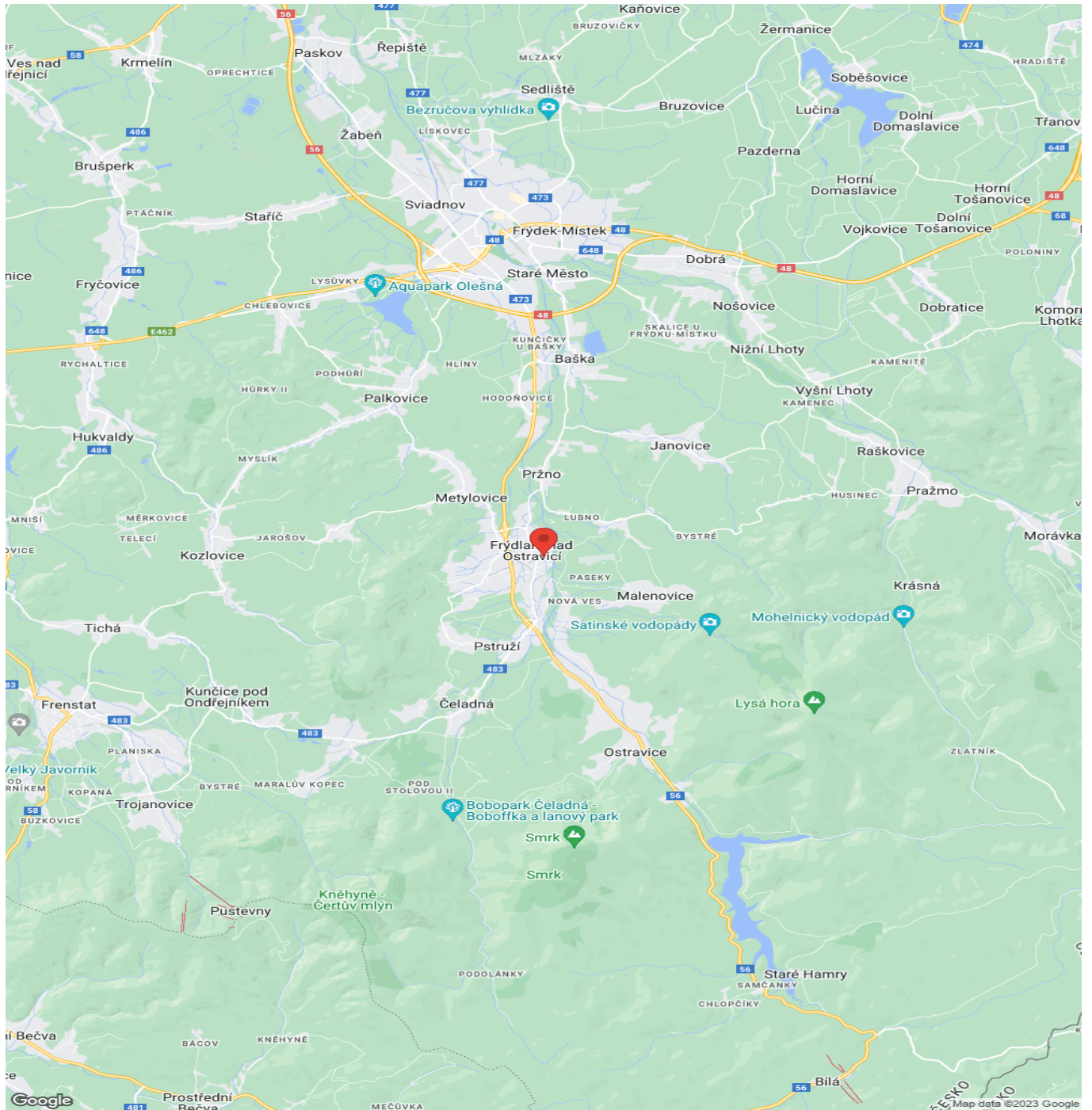
## PROJECT ADDRESS

Name	
Company	Efektivní dum s.r.o.
Street Address	Hamernická 233
Postal code	739 11
City	Frýdlant nad Ostravicí
Phone	
Email	
Notes	
Country	Czech Republic
Latitude [°]	49.59012
Longitude [°]	18.36238
Altitude [m]	358



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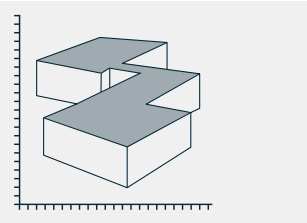
## PROJECT LOCATION



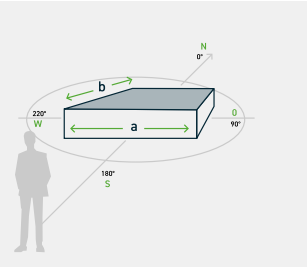
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## ROOF [ROOF\_1]

Building height h [mm]	7300
Slope of roof [°]	2
Roofing	Bitumen Roof
Product Type:	EVO 2.0 EastWest
System alignment [°]	163.4
Parapet height [mm]:	200
Parapet width [mm]:	340
Material of support structure:	unknown



Custom(Elev.)



System alignment [°]\*

## SNOW LOAD CSN EN 1991-1-3

Snow load [kN/m²]* (si=μi*sk):	1.6
Slope of roof [°]:	2
Snow load zone:	IV
Shape coefficient μi:	0.8

## WIND LOAD CSN EN 1991-1-4 NA:2008

Wind load [kN/m²]*:	0.59
Terrain Category:	3
Building height h [mm]:	7300
Wind zone (see wind zone map):	Area 2

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## PV-MODULE [ROOF\_1]

Manufacturer:	SUNPRO Power Co.Ltd
Name	SP460-120M10
Width [mm]:	1134
Height [mm]:	1910
Thickness [mm]:	35
Framing:	Aluminum
Weight (kg)	23.5
Nominal Power [Watt]:	460
Module Type:	Monocrystalline
Installation:	On Both Sides
Frame color	Aluminum
Temperature coefficient [%/°C]:	-0.35
Efficiency STC:	0.212
Output current MPP - STC [A]:	13.03
Output voltage MPP - STC [V]:	35.31
Short circuit current [A]:	13.8
Open circuit voltage [V]:	41.9
Temperature coefficient Power [%/K]:	0.048
Temperature coefficient Voltage [%/K]:	-0.27
Max. System voltage EU:	1500
Galvanic seperation required:	No

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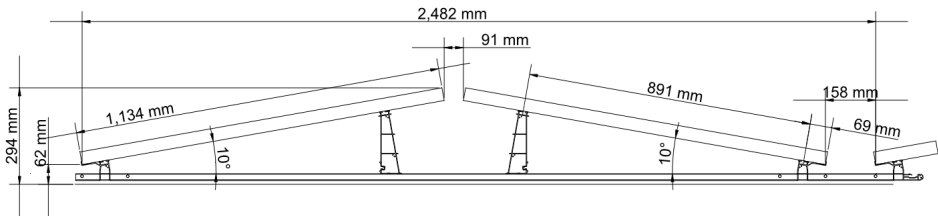
## CLAMPS [ROOF\_1]

Mid Clamp:	MK Typ 40-alu
End Clamp:	EK Typ 35-alu
<p><b>Note:</b> Please check to see if the terminal points of the module conforms with the specifications of the manufacturer. If the access points do not match the specifications of the module manufacturer, it is recommended to contact the module manufacturer in conjunction to obtain a release planning. There is no guarantee that the proposed connection is released by the manufacturer.</p>	

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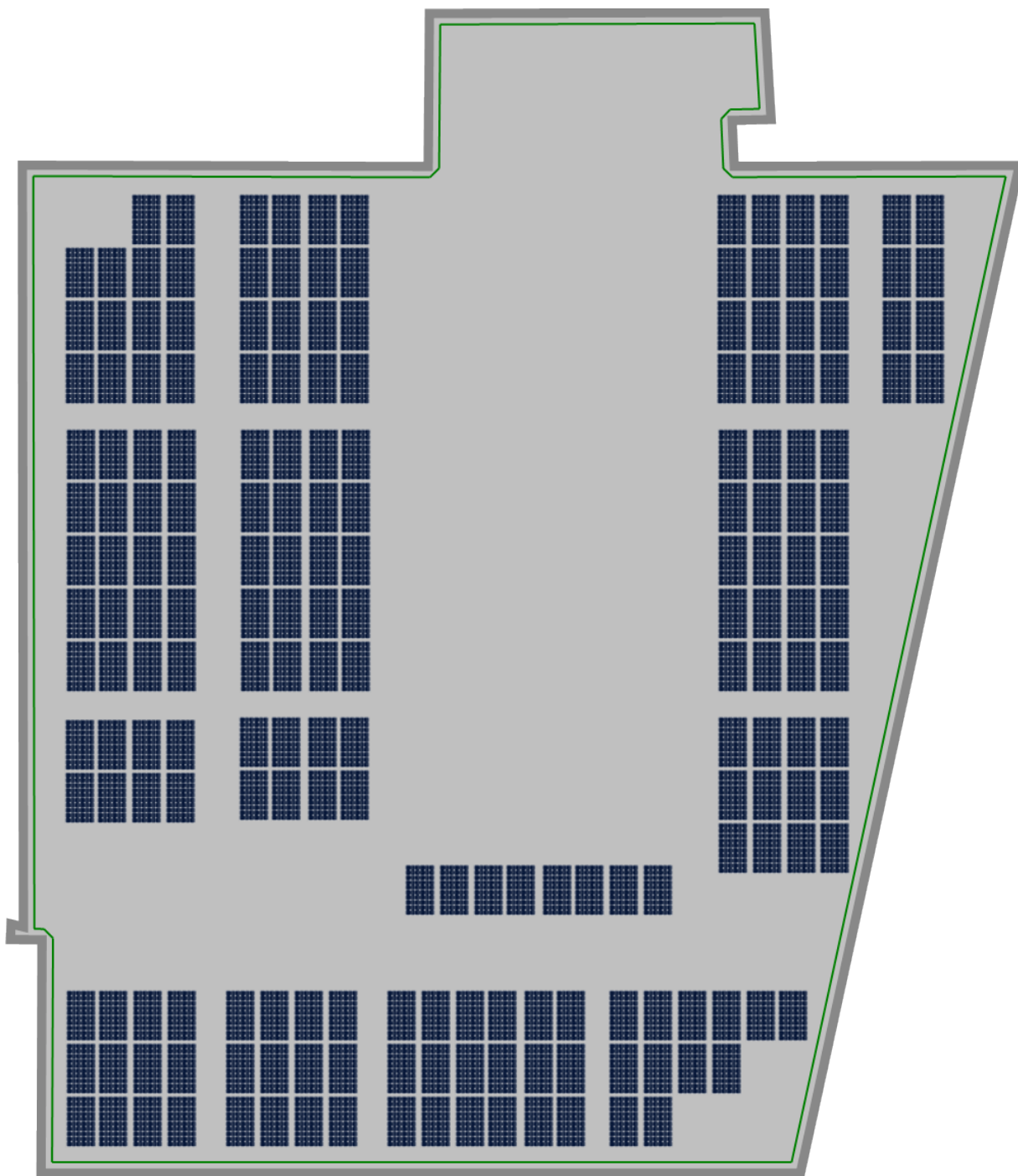
## RACKING PARAMETER [ROOF\_1]

Bracket tilt $\alpha$ [°]:	10
Inter-row spacing a:	200
System variant:	Eco (Leistungsoptimiert)
Friction Constant $\mu$	0.5
The default set-friction coefficient is 0.5 and checked by the installer / buyer (wet and dry test). If a lower friction coefficient is determined, it is mandatory to enter the value here, for the surcharge calculation! A higher value can be set to the maximum limit of 0.7 if it has been determined.	
Recommended distance to roof border [mm]:	200
User defined distance to roof border [mm]: min. (200)	200
Cross brace only in corners:	Yes
Cross braces for ballast positioning at edge	No
Cross brace for low-resistance connection:	No
Use third rail:	No
Stone weight [kg]:	15 kg
Ballast clamp at field edge:	Yes
Ballast clamp in the middle of the field:	Yes
Mechanical fastening:	No
Fastening against caterpillar effect:	No
Ballast trays used:	No
Maximum permissible weight per single module / double module [kg/m²]:	0
Wind tunnel report:	MEW07-1-3



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POSITION [ROOF\_1]





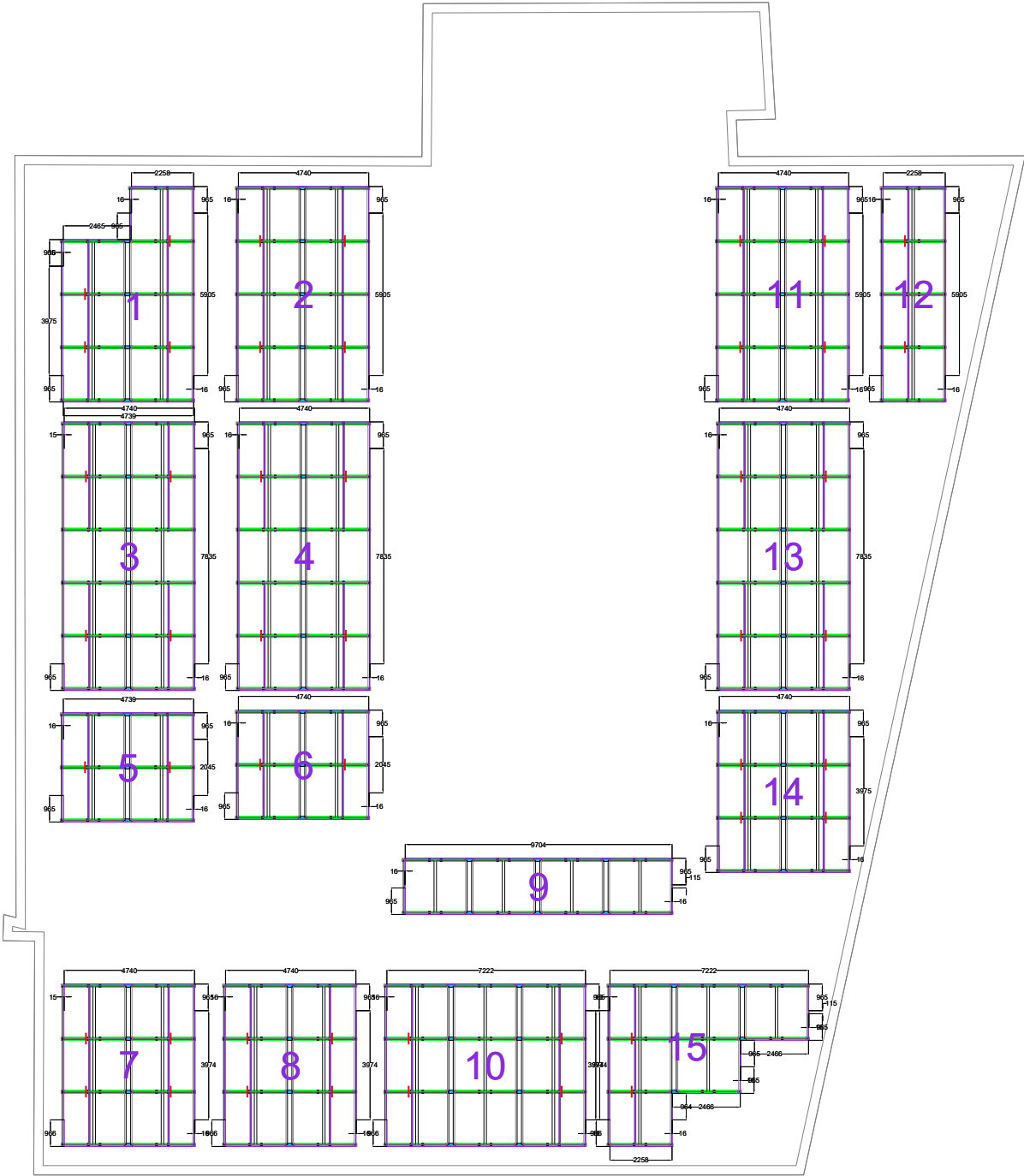
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DISPOSITION - GOOGLE MAPS [ROOF\_1]



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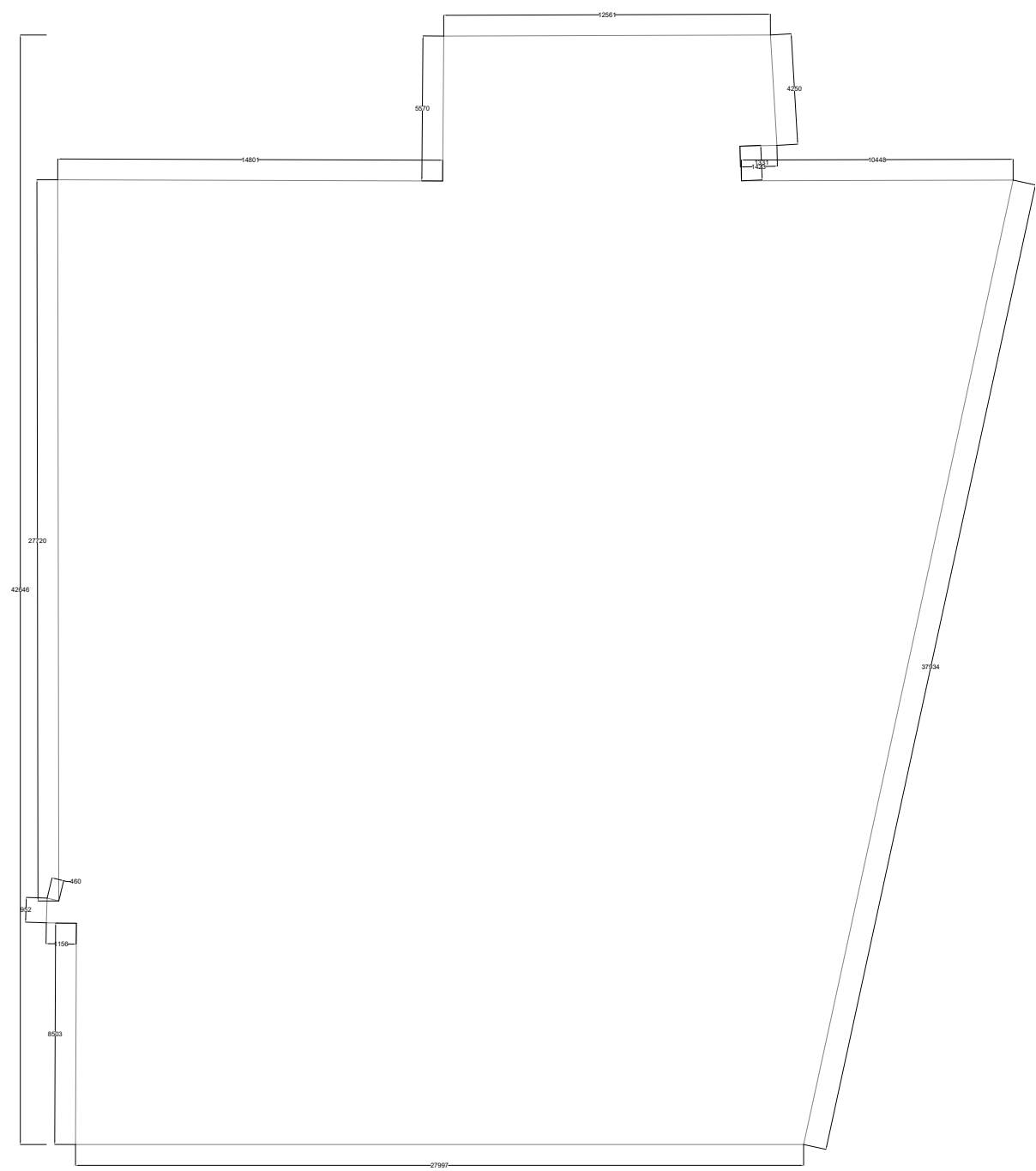
INSTALLATION-PLAN [ROOF\_1]





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ROOF COORDINATES [ROOF\_1]



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ROOF COORDINATES [ROOF\_1]

Coordinate 0	X: 478	Y: 9362	Z: 7300
Coordinate 1	X: 31	Y: 9471	Z: 7300
Coordinate 2	X: 0	Y: 8520	Z: 7300
Coordinate 3	X: 1156	Y: 8503	Z: 7300
Coordinate 4	X: 1122	Y: 0	Z: 7300
Coordinate 5	X: 29119	Y: 0	Z: 7300
Coordinate 6	X: 37176	Y: 37069	Z: 7300
Coordinate 7	X: 26728	Y: 37042	Z: 7300
Coordinate 8	X: 26670	Y: 38372	Z: 7300
Coordinate 9	X: 28093	Y: 38403	Z: 7300
Coordinate 10	X: 27843	Y: 42646	Z: 7300
Coordinate 11	X: 15282	Y: 42604	Z: 7300
Coordinate 12	X: 15238	Y: 37034	Z: 7300
Coordinate 13	X: 437	Y: 37082	Z: 7300





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## SUMMARY OF LOAD PARAMETERS [ROOF\_1]

Snow load	1.6 kN/m <sup>2</sup>
Wind load	0.59 kN/m <sup>2</sup>
Friction Constant $\mu$	0.5
Factor of Safety for Uplift	1.5
Factor of Safety for Sliding	1.5
Load factor applied to Dead Load	0.9
Weight per ballast block	15 kg
Number of ballast blocks:	380
System surface area	460.77 m <sup>2</sup>
Roof area	1,275.02 m <sup>2</sup>
Total ballast weight	5,700 kg
Weight Module/Rack	5,348.72 kg
Total System weight	11,048.72 kg
Surface load on system area	23.98 kg/m <sup>2</sup>
Surface load on roof	8.67 kg/m <sup>2</sup>
Max surface load on system area	36.96 kg/m <sup>2</sup>
Average horizontal load	0.1 kN
Maximum horizontal load	0.12 kN
Total horizontal load	10.19 kN










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## MATERIAL LIST [ROOF\_1]

Image	Part number	Description	Matchcode	Pck	Total Nr.	Total Nr. exacte	Total weight (kg)	Length (mm)	Total length (mm)
	52215-0132	MK type 40	mid clamp FH 30-50mm, l=40mm, alu	1	280	276	13.440	--	--
	52215-0133	EC type 35	end clamp FH 30-50mm, l=35mm, alu	1	270	264	15.120	--	--
	52215-1374	EVO 2.0 AEBP type 75	edge base profile 2.0, l=75mm	1	132	132	9.768	--	--
	52215-1377	EVO 2.0 V2BP type 267	connection base profile 2.0, l=267mm	1	69	69	18.078	--	--
	52215-1385	EVO T10 type 75	Tower 10°, for HBP inner dimension l=75mm	1	270	270	66.420	--	--
	52215-1390-02	EVO QSV type 390	cross strut connector, l=390mm, slot holes	1	48	48	12.480	--	--
	52215-1427	BEC type 35	ballast end clamp height 30-50mm, l=35mm, alu	1	60	60	3.360	--	--
	52215-1428	BMC type 40	ballast mid clamp height 30-50mm, l=40mm, alu	1	80	72	3.840	--	--
	52215-1460	S Typ M8x30	screw M8x30, ISO 7380-1, raised head, hexagon socket	1	200	172	2.400	--	--
	52215-1816	EVO B10 M6 type 75	base 10°, for HBP inner dimension l=75mm, module width >1016mm	1	270	270	68.850	--	--
	52215-2119-01	EVO 2.0 HBP type 2150	main base profile 2.0 EW 10°, l=2150mm, stand. adhered	1	135	135	284.175	--	--
	52215-2554	EVO QBS type 1898	cross and ballast strut, l=1898mm	1	86	86	82.990	--	--

### Optional articles

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Image	Part number	Description	Matchcode	Pck	Total Nr.	Total Nr. exacte	Total weight (kg)	Length (mm)	Total length (mm)
	000015	Stone 15	Stone 15kg - 40x40x4cm	1	380	380	5700.000	--	--
	52215-1279	cable tie edge clip type 3	cable tie 198x3,6mm with edge clip 0,5-2,5mm	1	300	270	0.600	--	--
	52215-1427	BEC type 35	ballast end clamp height 30-50mm, l=35mm, alu	1	100	98	5.600	--	--
	52215-1428	BMC type 40	ballast mid clamp height 30-50mm, l=40mm, alu	1	40	37	1.920	--	--
	52215-1460	S Typ M8x30	screw M8x30, ISO 7380-1, raised head, hexagon socket	1	200	20	2.400	--	--
	52215-2229	EVO 2.0 KD type 330	cable duct cover 2.0, l=330mm, VBP 267mm	1	14	14	0.532	--	--
	52215-2554	EVO QBS type 1898	cross and ballast strut, l=1898mm	1	10	10	9.650	--	--
	52215-2611	EVO 2.0 KD type 630 - Tower	cable duct cover 2.0, l=630mm - Tower, HBP 2013/2150-2450mm	1	27	27	1.944	--	--
	52215-3014	EVO AL univ.	distance gauge universal, ML=1570-2450mm	1	3	3	3.870	--	--
							6307.44		--

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## GENERAL SAFETY INSTRUCTIONS

**Please note that our general safety instructions must be observed.**

### **Installation only by qualified personnel**

PMT photovoltaic substructures may only be installed and commissioned by qualified personnel. These persons must be able to ensure the proper and professional installation of our products on the basis of their professional aptitude, which they have acquired, for example, through training or professional experience.

### **Before assembly starts:**

#### **1. Testing the static requirements of the roof and building:**

Before installing the PMT photovoltaic substructures, it must be checked on site whether the roof and building statics allow safe installation and safe operation of the photovoltaic system. This must be checked by a qualified person, for example a structural engineer, on site before installation. The information in the project report is based only on planning assumptions, which do not necessarily have to correspond to the conditions on site. Static requirements must therefore be clarified on site and in advance of installation. To do this, have the confirmation of a qualified person present and do not start the installation without such a document.

#### **2. Compliance with construction and accident prevention regulations:**

It is essential to comply with national and site-specific construction regulations, standards and environmental regulations.

Occupational safety and accident prevention regulations as well as regulations of the professional associations must be complied with!

In particular, the following must be taken into account:

- It is necessary to wear safety clothing [esp. Safety helmet, work shoes and gloves].
- For roof work, the regulations for work on the roof must be observed [e. g. use of fall protection, scaffolding with safety gear from an eaves height of 3 m etc.].
- The presence of two people is mandatory for the entire assembly process in order to be able to provide rapid assistance in the event of an accident.

#### **3. Check installation instructions for updates:**

PMT mounting systems are constantly being further developed. Installation sequences may change. Therefore, be sure to check the installation instructions for updates before installation. These can be found at <https://pmt.solutions/downloads/>. On request, we will also be happy to send you the current version of the installation instructions.

During the entire installation time, it must be ensured that a copy of the installation instructions is available to each installer.

#### **4. The module manufacturer's installation instructions must also be observed.**

#### **5. Equipotential bonding between the individual system components must be carried out in accordance with the respective country-specific regulations.**

**PMT assumes no liability for damages resulting from non-compliance with general safety instructions.**

# PROJECT REPORT FVE FRÝDLANT NAD OSTRAVICÍ KOTELNA

## GENERAL SYSTEM NOTES

### Basics of planning with PMT PLAN

#### What is PMT PLAN for?

PMT PLAN is used to plan the substructures distributed by PMT on roofs on the basis of data entered by the user and the planning assumptions based on this, which are stored in PMT Plan.

#### Who can plan with PMT PLAN?

#### Requirement of expertise for planning with PMT PLAN

The proper and correct use of PMT PLAN requires expertise and experience not only in the field of substructures for photovoltaic systems, but also in the construction industry with regard to the roofs on which the entire system is to be used by the end customer.

#### Who plans PMT PLAN?

#### 1. Data input by the user as the basis for planning

The starting point and basis for planning with PMT PLAN is always and exclusively the project data entered by the user. PMT does not check this data for accuracy. Rather, the user is solely responsible for correct data collection and entry in PMT PLAN.

**Attention:** If the data is not collected and/or entered correctly by the user, this will have an impact on planning. Changes can lead, among other things, to deviating quantities of material and deviating static requirements. This may lead to personal injury as well as financial losses for which PMT assumes no liability.

#### 2. Planning assumptions in PMT PLAN

PMT PLAN processes data entered by the user and uses certain planning assumptions in the process. These planning assumptions in turn result from technical regulations that underlie the calculations of PMT PLAN.

Which planning assumptions underlie the concrete planning can be taken from the project report.

PMT PLAN takes into account the Eurocodes, i.e. the European-wide uniform rules for design in the construction industry, including national annexes, as well as national building regulations.

PMT endeavours to ensure the up-to-dateness of the Eurocodes taken into account by means of updates. However, we would like to point out that after the publication of new rules, a certain period of time is always required to implement them in the software, which is why there is no entitlement to appropriate updates and the user is always responsible for observing the latest state of the rules on which the program is based.

The rules are applied on the basis of the specified location. It is the responsibility of the user to check planning assumptions for their correctness.

**Attention:** If planning assumptions are not checked by the user for correctness, this has an impact on the planning. Changes can lead, among other things, to deviating quantities of material and deviating static requirements. This may lead to personal injury as well as financial losses for which PMT assumes no liability.

#### 3. What is the purpose of the project report? What does "What's important is what's on the roof" mean?

PMT PLAN creates a project report based on the user's input. However, this planning report cannot and should not replace the expert planning based on actual conditions on site.

With the project report, the planning of your project is therefore not completed, but only begins.

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**Proper and professional procedure is only the following, which is solely the responsibility of the user:**

**First step:** Before ordering the photovoltaic substructures and even more so before installing them on the roof, the user must check the accuracy and plausibility of the data, planning assumptions and results in the project report.

**Second step:** ("What's important is what's on the roof!") It is imperative that the user verifies the project report also on the basis of the actual conditions on the roof. In our experience, project-specific features must be taken into account for each roof, which usually only arise on the roof on site.

If the user does not have the necessary expertise to review the project report, they must consult an expert person for this purpose. If changes arise from these mandatory audit steps compared to the project report, a new planning must be carried out with the changed data in PMT PLAN.

**Attention:** If the data is not and/or not correctly verified by the user based on the actual circumstances, this has an impact on the planning. Changes may lead, among other things, to deviating quantities of material and deviating static requirements. This may lead to personal injury as well as financial losses for which PMT assumes no liability.

**In addition, which other technical requirements must always be observed by the customer and checked independently?**

## a. Technical requirements for the roof and its components

PMT PLAN assumes that the roof and its components are suitable for the construction of a PV system and the customer has had this expertly checked before planning.

PMT PLAN does not guarantee the compatibility of the PMT photovoltaic substructure with the roof with regard to roofing, roof substructure and roof construction. Rather, this is to be checked by the user themselves.

Before installation, the user must ensure that the functional layers of the roof structure (e.g. waterproofing layer, thermal insulation layer) are suitable and designed for the installation of photovoltaic systems. In particular, it must be ensured by the user that the suitability for use of the thermal insulation layer continues to exist despite the additional loads which arise as a result of the installation of the photovoltaic system (substructure and solar modules).

**Tip:** To do this, have the approval of the manufacturer of the individual components granted and verify the manufacturer's specifications with the conditions on site on the roof.

The user must check the suitability, load-bearing capacity and serviceability of the entire roof structure for the installation of the photovoltaic system as a whole.

A structural engineer must be consulted to check the load-bearing capacity. PMT-PLAN does not replace this check under any circumstances.

**Attention:** If the user does not check the compatibility of the photovoltaic substructure with the roof and/or does not check it properly, this will have an impact on the planning. Changes may lead, among other things, to deviating quantities of material and deviating static requirements. This may lead to personal injury as well as financial losses for which PMT assumes no liability.

## b. Static requirements

PMT PLAN does not take into account the static requirements of the building on the roof of which the photovoltaic system is to be built.

Building and roof statics must therefore be professionally checked by the user before installation on his own responsibility. A structural engineer must be consulted for this purpose. PMT-PLAN does not replace this check under any circumstances.

**Attention:** If the building statics are not checked or not checked correctly by the user, this has an impact on the planning. Changes can lead, among other things, to deviating quantities of material and deviating static requirements. This may lead to personal injury as well as financial losses for which PMT assumes no liability.

## c. Photovoltaic modules

PMT-PLAN enables planning with a variety of photovoltaic modules. However, due to the large number of photovoltaic modules available on the market, not all modules are stored in the database. Missing modules are added to the database on a separate request based on the module manufacturer's data sheet.



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PMT does not guarantee the up-to-dateness of the module data. In particular, dimensions and weight parameters must be verified by the customer before planning.

PMT plan only takes into account the dimensions and weight of the modules. Other parameters are not taken into account.

Therefore, please check the compatibility of the module with the substructure before installation on the basis of the assembly guidelines of the module manufacturer.

PMT-PLAN requires that the module may also be used in the mounting form clamping on the short module sides. Therefore, please check whether the clamping points of the module comply with the manufacturer's specifications before installation. If the connection points do not correspond to the specifications of the module manufacturer, it is recommended to contact the module manufacturer in order to obtain a release of the planning.

This approval can either be generally available as part of the module certification or possibly also be granted by the module manufacturer on a project-specific basis.

**Attention:** If the compatibility of the substructure with the solar modules is not clarified by the user, this can lead to financial losses for which PMT assumes no liability

## d. Securing the photovoltaic system against shifts due to thermal expansion (so-called "caterpillar effect")

Die Photovoltaikanlage ist auf dem Dach stetigen Temperaturschwankungen ausgesetzt. Dadurch kann es im The photovoltaic system is exposed to constant temperature fluctuations on the roof. As a result, very slow migration effects of the substructure on the roof waterproofing can occur over the course of the service life of the photovoltaic system, even with a very flat roof inclination. This process is also referred to as "temperature migration" or more vividly as the "caterpillar effect".

The gradual displacement of the photovoltaic system on the roof can lead to damage to the cabling, the roof covering (such as, for example, film, bitumen, gravel, substrate, etc.) of the further functional layers and any rising components present (such as, for example, skylights, aeration and ventilation systems, drainage systems, chimneys etc.). In the worst case, the photovoltaic system can gradually move beyond the roof edge over time.

In order to prevent this damage, we have decided to give a general recommendation for a connection from 1.0° roof pitch.

This follows from a recommendation of the German Solar Industry Association (Bundesverband Solarwirtschaft e. V. – BSW-Solar), titled: "Position Securing Due to Thermal Expansions ("Temperature Migration)".

Suitable measures for securing the photovoltaic system against displacements due to thermal expansion are, for example, the coupling of module fields via the roof ridge or selective fastening of the system to the roof structure.

With the introduction of the new version of the EVO 2.1 system with ProPlate and its mechanical attachment to the bottom rail, we are adapting our recommendation for connecting the EVO 2.1 system to a flat roof. However, this amended recommendation only applies to the EVO 2.1 system. The connection to the roof must only be made from a gradient of about 2% (roof inclination about 1.15°), provided that the following requirements are met:

- The **PMT checklist** must be completed in full and has been taken into account in the planning.
- Compliance with the following **maintenance routine** by PMT's customer:

Maintenance interval	Shift	Measure
Annual maintenance	No shift	No need for action
Annual maintenance	up to approx. 2cm	Inspect the situation with special attention during the next maintenance
Annual maintenance	2-3 cm	Intermediate inspection after approx. 6 months
Intermediate inspection (6 months)	further shift of 1.5 cm or more	subsequent mechanical connection

**Attention:** Failure to secure the photovoltaic system against displacement due to thermal expansion may lead to personal injury as well as property and financial losses for which PMT assumes no liability.

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## INSTALLATION INSTRUCTIONS AND MAINTENANCE

### Installation instructions

**Installation should not begin until the site manager's written request has been received.**

The components of the PMT mounting system are used exclusively for mounting PV modules. Depending on the type of roof of the building and the quality of the roof, the components intended for this purpose must be used. The exact article versions can be found in the project documents, consisting of project report and CAD plan.

When using the mounting system, it is essential to observe the installation instructions, safety instructions and system instructions.

In the event of improper use of the components, non-compliance with the instructions and the use of components not belonging to the system, any claim to warranty, guarantee and liability towards PMT shall lapse. The user is liable for damage and consequential damage to other components, PV modules or the building, as well as for personal injury.

Before starting the installation, the compatibility between the roof skin and the installation system must be tested and ensured and the roof checked for damage of any kind. These must be recorded in the **Roof Inspection Protocol**.

Repair work may be necessary.

In the case of very uneven roofs or roof seals, compensation measures must be taken if necessary to ensure uniform load introduction. In order to ensure a flat support of the main bottom profiles on the roof skin, the roof surface must be cleaned before construction begins and impurities, such as moss, leaves, dirt, stones, etc. removed.

The necessary distances to the roof edges specified in the project documents must be observed. The maximum module field size depends on the type of roof. In the case of roofs with substrate or gravel fill, it must be ensured that a sufficiently non-slip connection is made.

The surface load must not exceed the residual load-bearing capacity of the building. It must be ensured that the runoff of rainwater is not hindered. Roof drainage must be included in the installation planning.

It must be checked whether lightning protection provisions have to be changed and reworked as a result of the installation of the PV system.

A thermal separation (distance between module fields) must be maintained according to the PMT PLAN project documents.

**Attention:** If the actual module dimensions exceed the module widths specified in the table, assembly must not be started.

The specified tightening torques in these assembly instructions must be observed urgently.

After events such as storms, heavy rain, earth movements, etc., the system must be checked by a specialist for damage. If damage is detected during the inspection, these must be remedied immediately. Defective components must be replaced by new components.

### Maintenance

Photovoltaic substructures are not maintenance-free. Maintenance, in particular of the correct positioning of the ballast bricks and the building protection mats, must be carried out annually and documented in a maintenance log. Furthermore, all components of the PMT mounting system must be checked at regular intervals and documented accordingly. We recommend annual maintenance as per our **maintenance protocol**.

The recommendations for maintenance routines of the EVO 2.1 system due to thermal expansion must be observed.

After exceptional strong-wind events, we recommend maintenance immediately after the strong-wind event.

**Attention:** Failure to maintain the installation may lead to personal injury as well as financial losses for which PMT assumes no liability.

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## FINAL EXAMINATION

- Check whether the entire system and all components have been installed according to the current project report.
- It must be checked whether all screws are inserted at the intended points and tightened with the specified tightening torque.
- The information on the tightening torque can be found in the assembly instructions or on the packaging. Attention! These are safety-relevant and can lead to considerable damage if not observed.
- Check whether all ballast assembly has been performed with the specified weights. The information can be found in the current project report. Make sure that slipping, tilting or wobbling of the ballast elements is permanently eliminated. Attention! These are safety-relevant and can lead to considerable damage if not observed.
- Check that all click connections are locked correctly.

## MAINTENANCE

- The upper and lower limit of the tightening torque of the fittings must be checked regularly during maintenance (maintenance interval at least once a year; observe maintenance protocol).
- The recommendations for maintenance routines of the EVO 2.1 system due to thermal expansion must be observed.

## WARRANTY AND PRODUCT LIABILITY

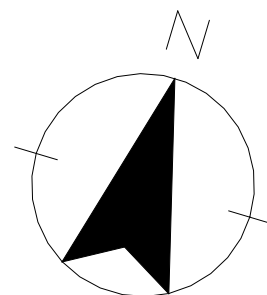
Please note that a product warranty is only granted in accordance with our warranty conditions if all safety and system instructions have been observed and the system has been installed properly. The warranty conditions can be found at [pmt.solutions/downloads/](https://pmt.solutions/downloads/) .

Project created on: 11/9/2023  
Project created by: David Mamula

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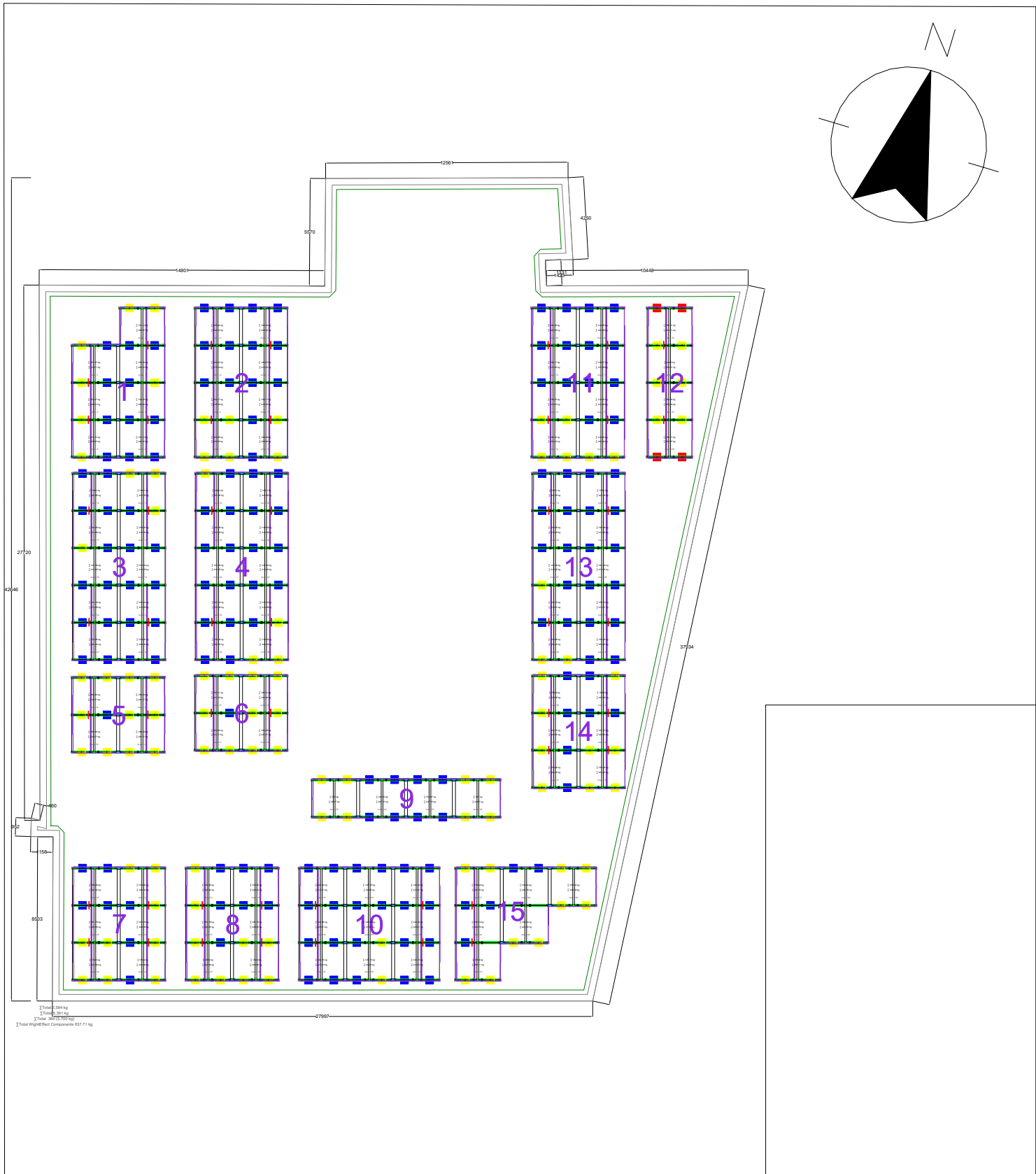
**PMT**

Industriestr. 25  
D-95346 Stadtsteinach  
T +49 9225 9550 0  
info@pmt.solutions



- EVO20V1BPTyp267
- EVO20T10Typ75
- EVO20QSVTyp390
- EVO20QBSTyp1636
- EVO20HBP10Typ2150
- EVO20B10Typ75
- EVO20AEBP75

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		Title	23TG108	
		FVE Frýdlant nad Ostravicí Kotelna	R1	11/9/2023
Roof_1			DE	1/1



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