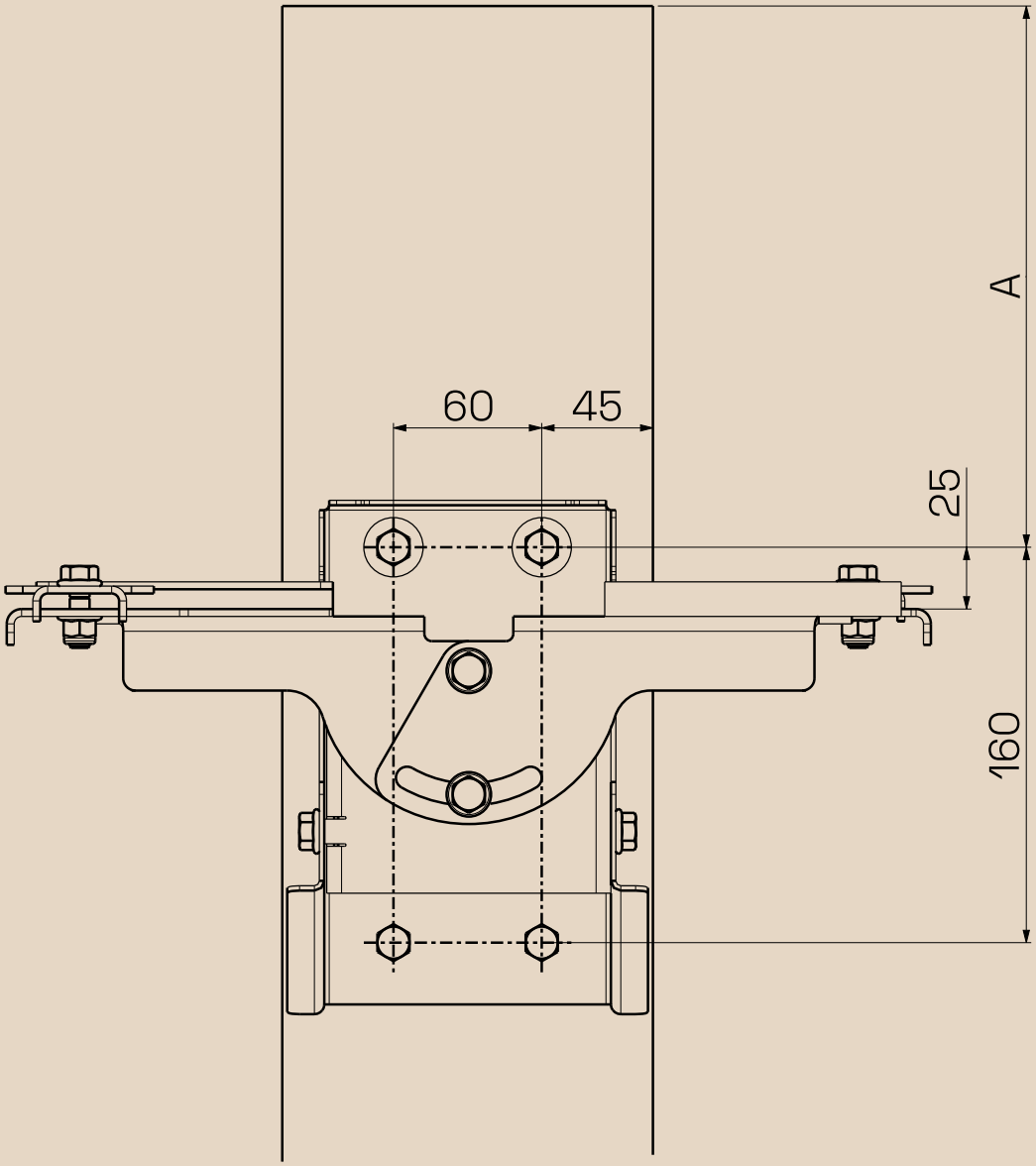
GMAX POST MOUNTED TROUGH SYSTEM

Installation manual



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Content

Introduction

The GMAX post mounted Cable trough system consists of GRP heavy duty troughs and lids available in 2 sizes. Lids can be fitted and removed without the need for special tools.

The troughs are designed to be installed above ground level and are supported upon GRP posts available in 3 height options. Connection of trough onto post is achieved with steel mounting brackets (Single span according to Network Rail NR/L2/TEL/00013). The range of mounting brackets have been designed to be versatile and ensure routes can be installed in difficult terrain where a straight route is not always possible. All mounting brackets are made from Galvenised Steel to be resistant to corrosion in harsh environments.

All products have been developed using finite element analysis to optimise shape and materials. Extensive physical load testing has been carried out on prototypes to ensure the troughs can carry our stated loads at a maximum 6 metre span.

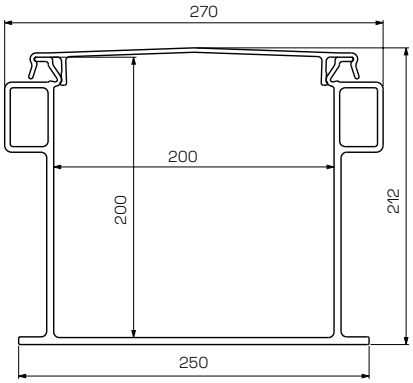
Strength of troughing has been achieved using a thick walled pultruded profile with a high density of glass fibre rovings and multi directional mesh. The design is purposely robust without reliance on twin walled or excessive multi chamber construction which give rise to a thin, delicate structures. The robust nature of the design ensures the trough is highly resistant to impacts and unforeseen damage that can often occur during installation and general use. The trough is reinforced with heavy duty box sectional chambers at the top of the section to increase vertical stiffness and also resist horizontal side forces induced by windage.

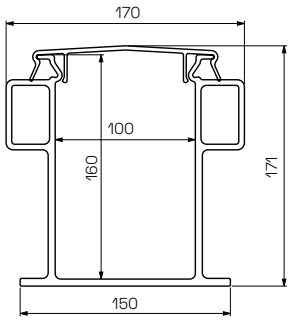
Two resin system are available which have been formulated to match the fire performance requirements of Network Rail for outdoor applications and London Underground for tunnels/stations. Both systems as standard contain UV inhibitors and a resin rich mesh surface veil to protect against damage from sun light.

GMAX Explantation of parts

Trough/Lid Details

GMAX, heavy duty pultruded trough and lid are available in 2 sizes to ensure efficient cable fill capacity and economical cable runs. Lids are secured with a positive clipping action that, under normal use do not require additional fixation. Lids are fitted by aligning the lid over the top of the trough, using a soft faced hammer tap the lid downwards starting at one end and continuing along whole length. Removal is achieved by forcing a lever under the lid at one end (e.g., screwdriver >10 mm tip) of the trough and levering the lid upwards, once detached at the end the lid can be peeled off along the length of the trough. Peel force is approximately 15kg's.





	200x200 GMAX trough & lid	100x160 GMAX trough & lid
	Trough part number	
Py1 resin	GRP2002006MPY1	GRP1001606MPY1
Mx resin	GRP2002006MMX	GRP1001606MMX
	Lid part number	
Py1 resin	GRC2006MPY1	GRC1006MPY1
Mx resin	GRC2006MMX	GRC1006MMX
	Trough weight(kg)	
Py1 resin	42	32.4
Mx resin	45.6	35.4
	Lid weight(kg)	
	8.8	5.9
	Length(m)	
	6	6
	Max span(m)	
	6	6
	Max load with 6 metre span*	
	90kg/m + 75kg midspan point load	45kg/m + 75kg midspan point load
	Internal area (mm2)	
	40000	16000

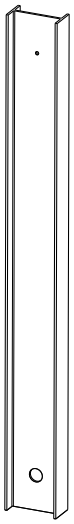
*According to Network Rail standard

GMAX Explantation of parts

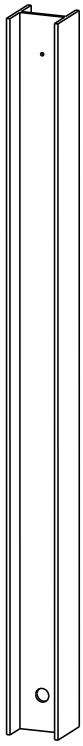
Post Details

Elevated troughs are supported on GRP posts which are available in a number of different lengths and sections to ensure the most economical solution can be used for installation. Brackets for supporting the troughs onto the post are either fitted to the top of the post (Top Mounting) or side of the post (Cantilever). Posts are pre-drilled for Top Mounting Brackets. Holes for fixing Cantilevers are drilled on site after first positioning the Cantilever at the required height on the post.

Light Duty Post



Heavy Duty Post



Post Selection

	Light Duty	Heavy Duty	
	MPG20L6MPY1 MPG20L6MMX	MPG24H6MPY1 MPG24H6MMX	MPG30H6MPY1 MPG30H6MMX
Top Mounting	•	•	•
Cantilever		•	•
Max Trough Elevation(M)	1	1.4	1.5
Length(M)	2	2.4	3.0

Post MPG20L6MPY1/MX cannot be used with cantilever brackets

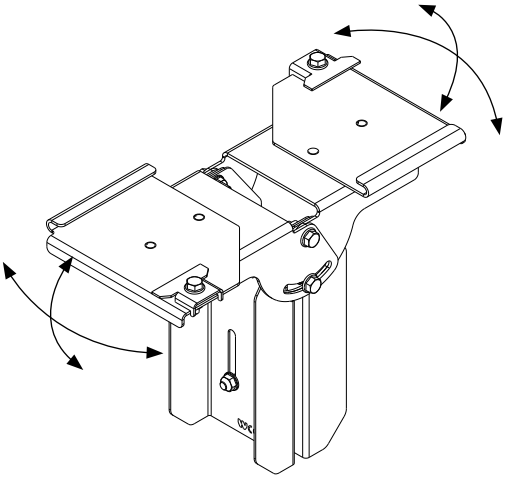
GMAX Explantation of parts

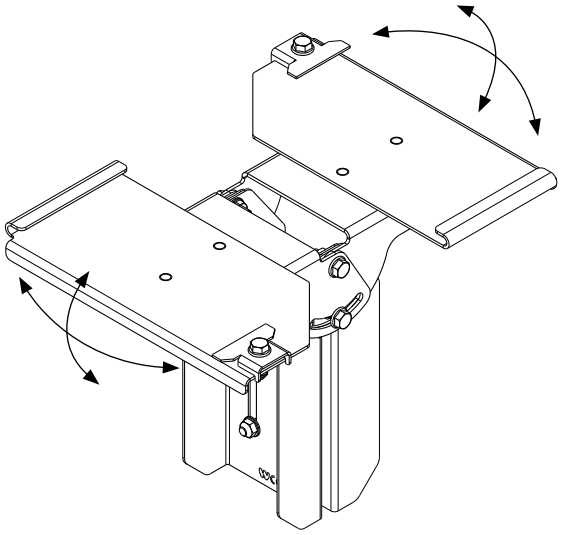
Bracket Details

All brackets are manufactured from high strength galvenised steel and have been designed to fit MITA GRP posts. Brackets are either fitted to the top of the post (Top Mount) or side of the post (Cantilever). They available in two sizes to fit 100x160 and 200x200 trays.

Adjustable Top Mounting Bracket – PM100, PM200

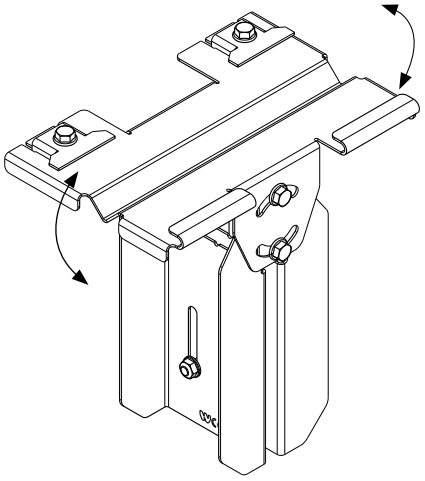
For fitting GMAX trough to top of GRP posts, the brackets feature angular adjustment of +/-30˚in both vertical and horizontal planes on both sides of post and 50mm of vertical adjustment to allow for versatile installation without the need for numerous types of brackets with limited functionality. These brackets can be used where the route is not level or where large changes in direction are required.

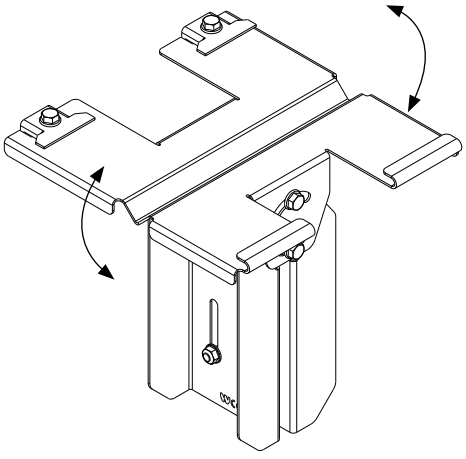




Incline Top Mounting Bracket – RB100, RB200

For fitting GMAX trough to top of GRP posts, the bracket have 50mm of vertical adjustment and feature a swivel adjustment of +/-45˚in vertical plane for routing on inclined embankments. This bracket can also be used for cost effective routing where ground conditions are predominantly level and Post height is within +/-20mm of adjacent posts.

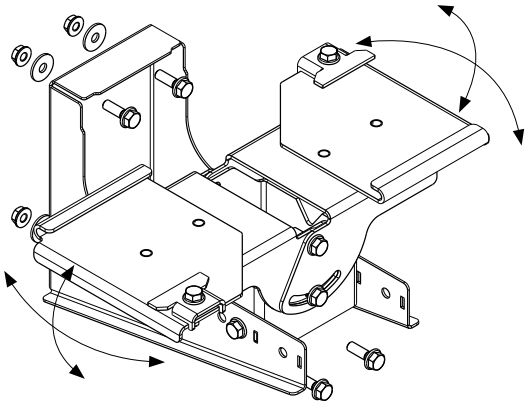


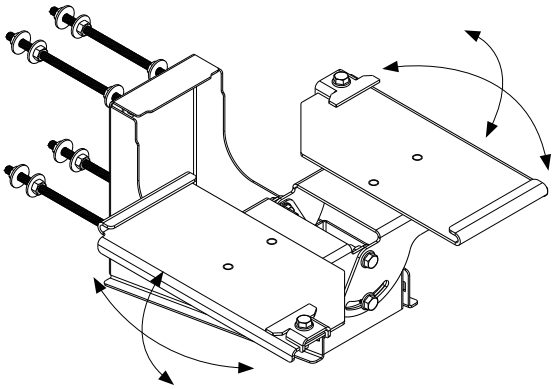


GMAX Explantation of parts

Adjustable Cantilever Bracket – CB100, CB200

For fitting GMAX trough to sides of GRP posts, the brackets feature angular adjustment of +/-30˚in both vertical and horizontal planes and can be fitted to the sides of the posts at any height with consideration of clearance for removing lid.





Bracket Selection

		Trough sizes	
Part code	**Fitting position**	200 x 200 mm	100 x 160 mm
PM100	Post top		•
PM200	Post top	•	
CB100	Cantilever		•
CB200	Cantilever	•	
RB1006M	Post top		•
RB2006M	Post top	•	

GRP Material

GMAX GRP Trough is a product from Pultrusion process according to EN 13706 and is available in two resin options (PY1 & MX) for use in outdoor or indoor locations. Both resins offer excellent resistance to extreme environments, UV resistant additives and resin rich surface veil ensure high resistance to UV radiation. Excellent corrosion resistance in coastal, industrial and polluted environments to C5 / CX environmental classification according to ISO 9223. Ensuring a service life of many decades without degradation of mechanical properties.

Material designation:

	- Pultrusion EN 13706 -UGV, IFU, E23 (Polyester) - Pultrusion EN 13706 -UGV, AFU, E23 (Acrylic)
Working Temp Range	-40 to +90 degrees centigrade
Coefficient of Expansion	0.08-0.11
PY1 Resin	Polyester(PY1)Network Rail Approval
MX Resin	Acrylic(MX)London Underground Approval
Concrete pH compatibility	From 8,5 to 12,5 for post installation (For other pH´s contact to technical dept.)
Fire Performance	See Appendix 1

GRP Material Selection

Material	Application
PY1	Outdoor aggressive, Rail track side installations
MX	Indoor aggressive, Rail tunnel, Underground station

Metallic Material

All Supports brackets fitted to posts are manufactured from high strength galvenised structural steel, chosen to give the required balance of resistance to deformation and corrosion. The material and production methods give a clean finish that will not collect debris which can cause areas of localised corrosion.

All fasteners are Stainless Steel 316 (A4)

Delivery and storage

Cable troughs will normally be delivered on large disposable pallets for unloading with a forklift or equivalent site vehicle. Ensure impact damage does not occur during unloading and check for transit damage after unloading. It is important that no signs of damage are detected, if so then contact supplier for a replacement. The troughs are robust and have been designed to resist heavy impact, if damage is observed then this would be as a consequence of extreme impact during transit.

Troughs can be stored outside, preferably on their delivery pallet as this has been designed to protect edges from side impacts, trough pallets should not be stacked. It is recommended to store metallic items (brackets, fasteners) indoors to prevent deterioration of packaging material.

Safety and handling

Safety

GRP material is generally a safe product to handle and work with, the following precautions should be observed.

Emergency and first aid measures

EYES – Immediately flush with water for 10 minutes, seek medical advice if needed
SKIN – Splinters from broken profile should be removed immediately whilst the splinter is still visible as GRP does not show on an X-Ray.

Fire fighting

Products are not flammable or easily ignited but will be destroyed in a fire. The use of suitable protective equipment such as goggles and breathing apparatus should be observed.
Extinguishing Media – CO2 Dry Chemical Foam

Handling

Due to large bulky nature of the product, manual handling procedures should be followed.
When handling broken or damaged GRP it is advisable to wear heavy duty gloves to protect against splinters.

Cutting

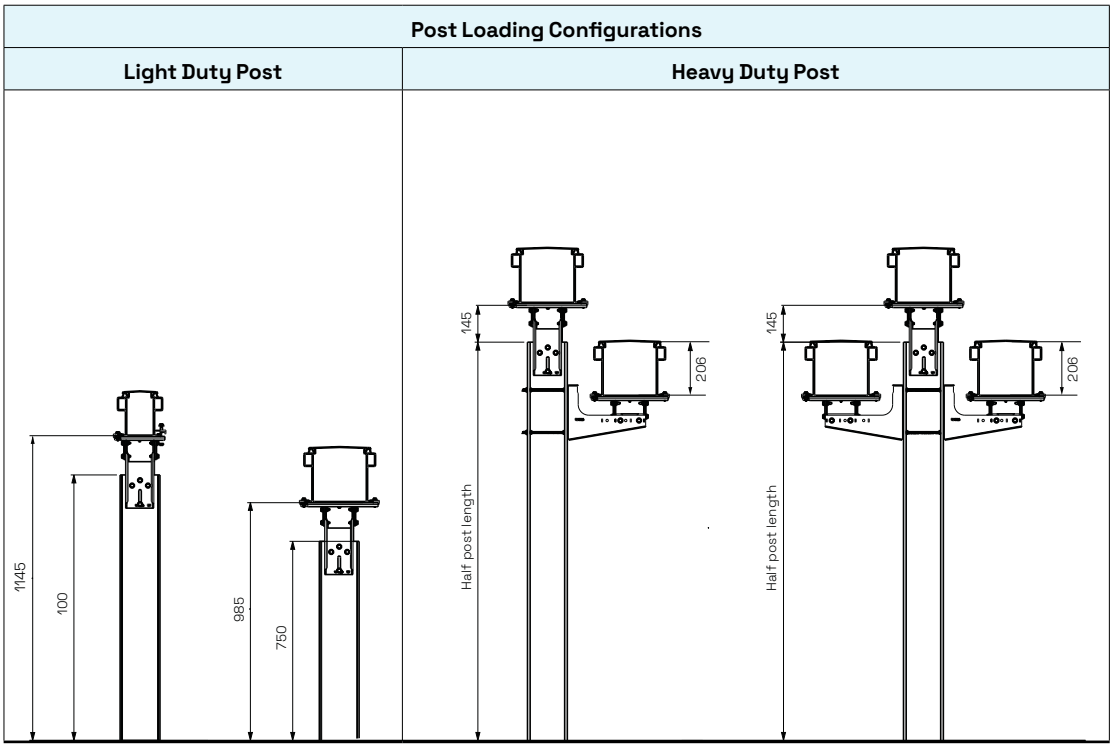
Dust will be produced when cutting or drilling on site, all fabrication activity should be performed in a well ventilated area. It is advisable to wear a dust mask and eye protection.

Survey site

An in depth site survey should be performed to access the installation requirements. Cable route elevation, ground conditions and position of cable route in respect of relevant Railway authority should be considered. Areas with potential for snowdrifts, snow plough operation or rock fall should be carefully considered. Installation of elevated troughing in these areas is not recommended and it would be the decision of the Railway authority to advise the most suitable cable containment.

Post hole considerations

We recommend that posts should be embedded for aprox half their length into the support substrate, although this is dependent on ground conditions. It is therefore recommended that a full survey is conducted along the length of the installation.
Post should be installed into a bored or dug out post hole of the correct depth and back filled with concrete/post mix or similar product approved by the Railway authority.



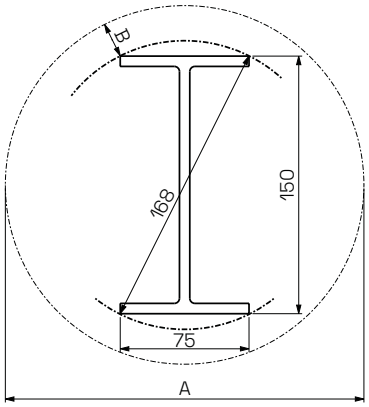
Post hole considerations

Post hole diameter is dependent on a number of factors and should be calculated by the client or rail authority taking into account the following.

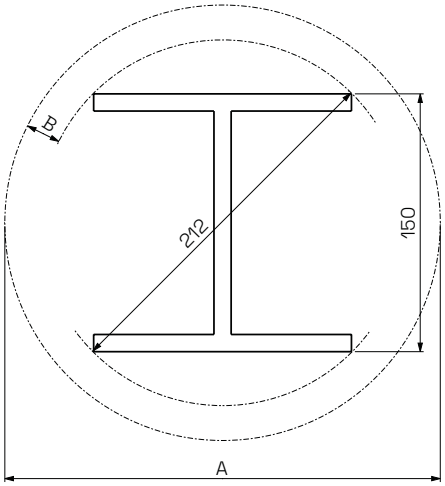
Size of Post – To maintain the minimum thickness of post infill between the post and sides of the Post hole at point B. This is dependent on the type of post hole infill material and guidance should be sought from the material manufacturer.

Minimum Post hole diameter (A) = Diagonal dimension + (2B)
Where (B) = Post Fill Manufacturers recommended minimum thickness

Light weight post 150 x 75.
168mm Diagonal dimension

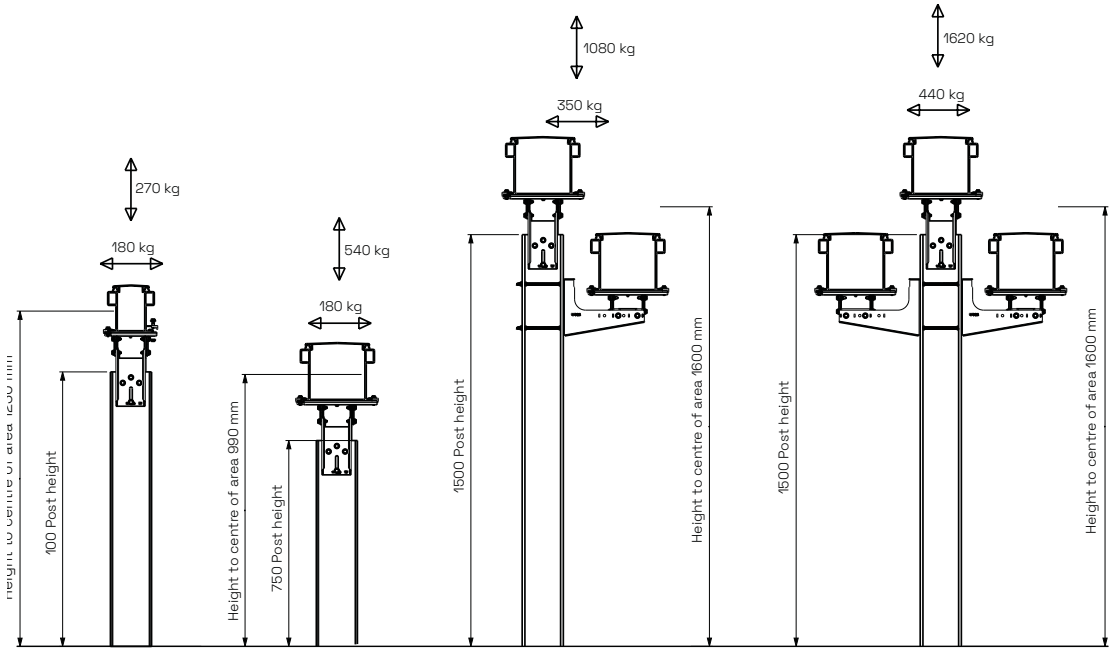


Heavy Duty post 150 x 150.
212mm Diagonal dimension



Post hole considerations

Loads applied to post with fully loaded Trough and Wind force of 1.45kN/m² – Loads and Turning moments shown are the maximum capacity of the troughing system, actual installed values may be lower.



	Light duty post		Heavy duty post	
Trough	1x100x160	1x200x200	2x200x200	3x200x200
Vertical Load	270 kg	540 kg	1080 kg	1620 kg
Load due to wind	180 kg	180 kg	350 kg	440 kg
Height to centre of area	1230 mm	990 mm	1600 mm	1600 mm
Turning moment	2172 N/m	1750 N/m	5500 N/m	6910 N/m

Trough installation

Installation of cable route should be carried out on the basis of approved planning or consultation with the appropriate rail operator who will issue installation drawings or guidelines.

All supplied parts of the GMAX system should be inspected prior to installation to ensure no damaged parts are used. All parts need to be defect free to ensure they can safely withstand design loads. It is permitted to cut troughs and posts to length on site to achieve the required geometry to traverse difficult or obstructed areas of the installation. It is recommended to temporarily fit lid when cutting angles, this stabilises the trough and ensures the lid will be cut to give a perfect fit.

Troughs should always be used with lids, which should be fitted immediately after installing cables into the trough.
It is important that the GRP cable trough and lids must not be under tension when installed on the Post supports.

Tools Required

The system has been designed to require the minimum amount of hand tools to connect the troughs to the posts. Post holes should be dug or bored using the installers preferred method for the conditions found along the route. Assembly of trough to posts requires the following:

Electric drill with a min of 9mm diameter drill capacity
Ratchet socket set driver with extension
Torque wrench
13mm socket
13mm spanner
Tape measure(min 6 metre) or 6 metre setting bar
Tape measure 30 metre
Protractor
Level, theodolite or some other form of checking horizontal/vertical level
String line
2 x Ratchet “G” clamps
Course hand file or surform
Soft faced hammer
Hand saw, Reciprocating saw with carbide tipped blade, Large disc grinder with diamond cutting disc
Complex angle cuts can be difficult to achieve on site, especially when the cut is angled in two planes. It is advisable to practise these compound cuts before cutting parts to be installed. A neat, angled cut can be achieved using a multipurpose demolition hand saw. The fibrous nature of the GRP will wear the saw out in a relatively short space of time, so it is best used only for difficult cuts.

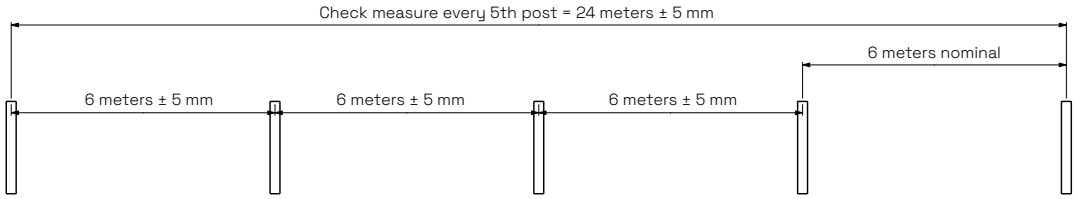
Trough installation

Post Spacing

Post type and length should be selected to achieve the required trough elevation and type of brackets to be used (see Post selection page 4)

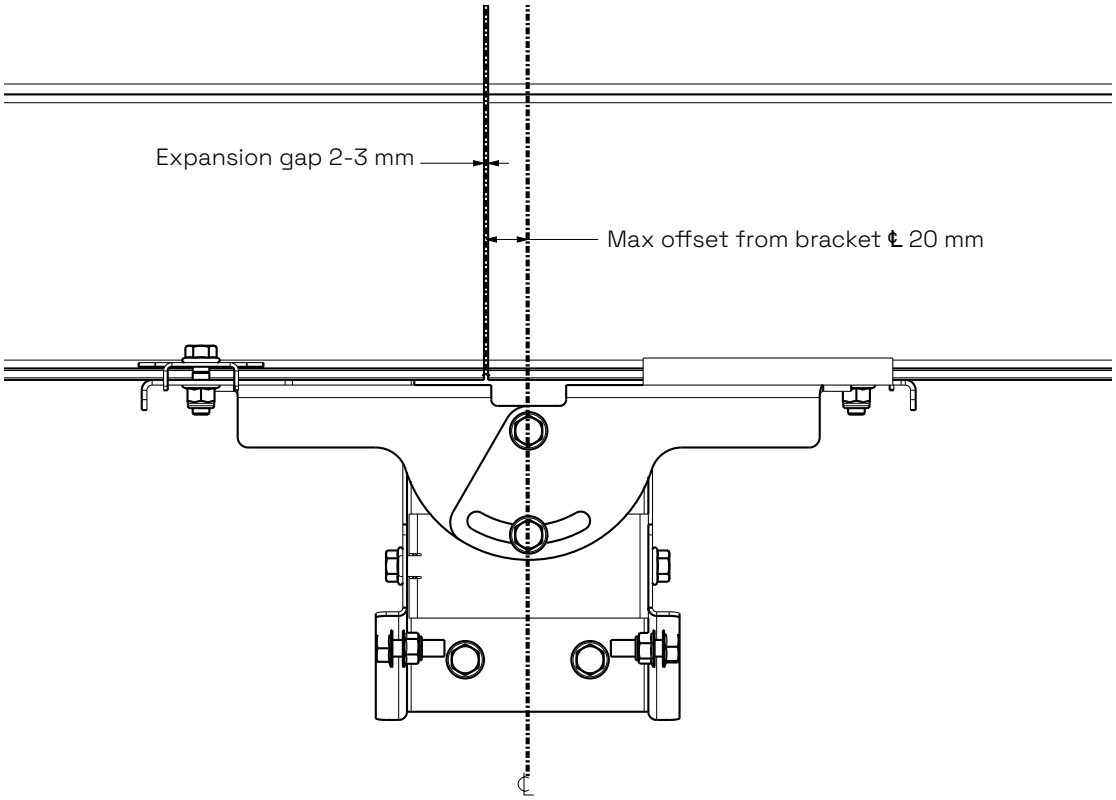
Posts should be installed along a planned route dictated by the client or rail authority.

Space posts at 6 metre (+/- 5mm) intervals along the route, ensure posts are vertical when embedded. Check the accumulated measurement after every 5th post is fitted, adjust the position of the 5th post to achieve a 24 metre spacing from the 1st post



Expansion gap & allowable offset

Posts should be installed at 6M spacings, troughs are supplied at 5998mm which will ensure a 2mm expansion gap is present between adjacent lengths. The gap should be positioned within 20mm either side of the centre line of the bracket.

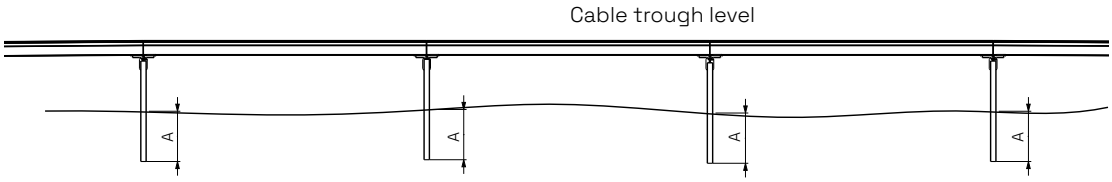


Consideration when sellecting brackets & posts

Inclined top mount brackets (RB100, RB200), level terrain

When the cable route is running along very level terrain with only small changes in localised ground height(approx. +/-50mm over any 6M span)the posts can be fitted at the same height and Top Mounting brackets RB100, RB200 can be used

Tops of posts must be set level to within +/-20mm, Brackets must be set level to within +/-5mm from adjacent brackets. For use with straight runs or shallow bends of typical rail track radius.

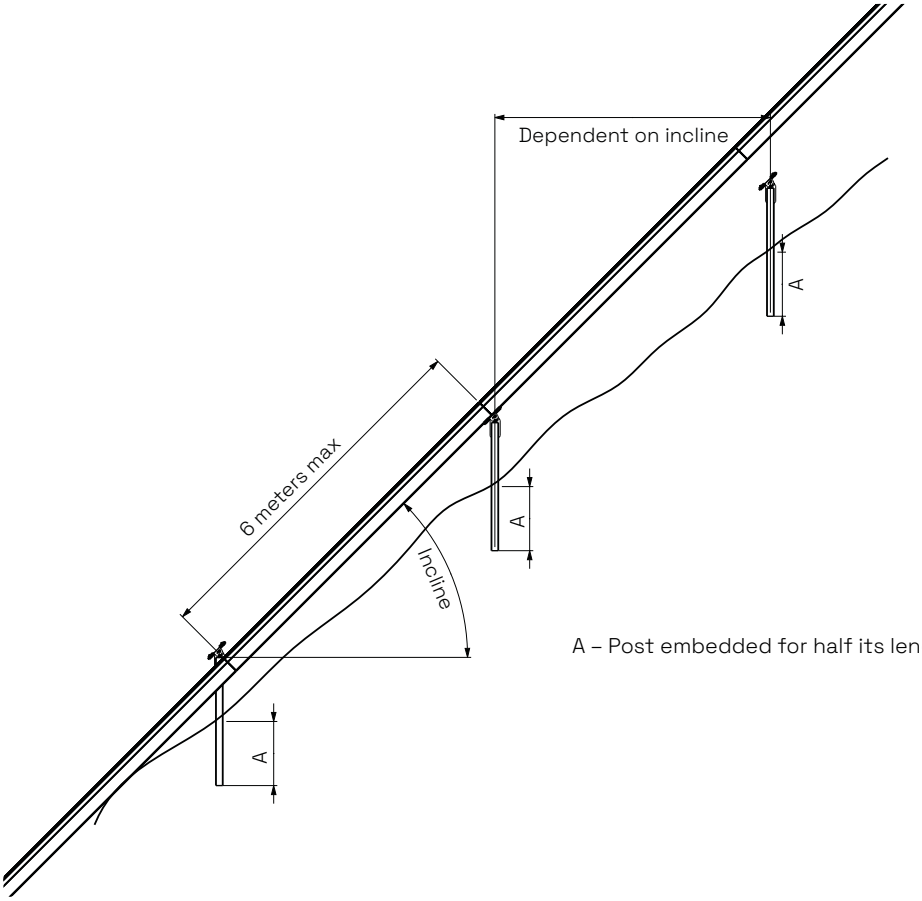


A – Post embedded for half its length

Inclined top mount brackets (RB100, RB200), embankment/incline

When the cable route is running down an embankment or an inclined area. The posts should be set vertical and the trough should run over the top of the post using the

Inclined Top Mount Bracket(RB100, RB200). Max incline is 45 degrees and post distance should be measured along the incline angle

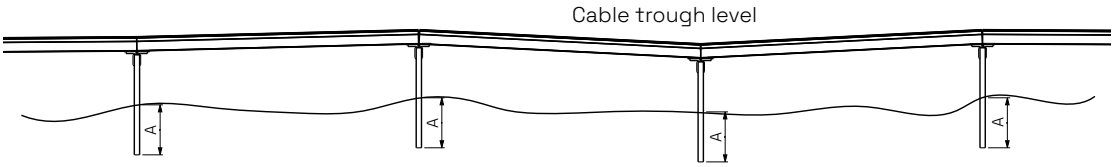


A – Post embedded for half its length

Trough installation

Adjustable top mount brackets (PM100, PM200), uneven terrain

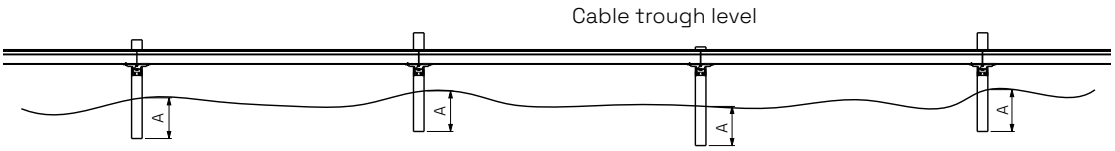
Where the cable route is running along undulating terrain that cannot be guaranteed to be level within +/-50mm. Posts height cannot be maintained level so Mounting brackets PM100/PM200 should be used. These brackets have large amounts of adjustment. Large changes to the route level and direction are possible, within the limits of the +/- 30° adjustment in the brackets. However it should be noted minimum cable bend radius must be respected



A – Post embedded for half its length

Adjustable cantilever brackets (CB100, CB200) uneven terrain

For cable routes that run over undulating terrain but it is desirable to have a level cable run. Then Cantilever BracketsCB100/CB200 are recommended, these brackets fit to the side of the heavy duty post and their fixing holes are drilled on site after setting the cantilever to the desired height on the post. The Cantilevers can be fitted at any height on the Post so a level run can be achieved. These brackets also have the advantage of +/-30° of adjustment in horizontal & vertical planes.



A – Post embedded for half its length

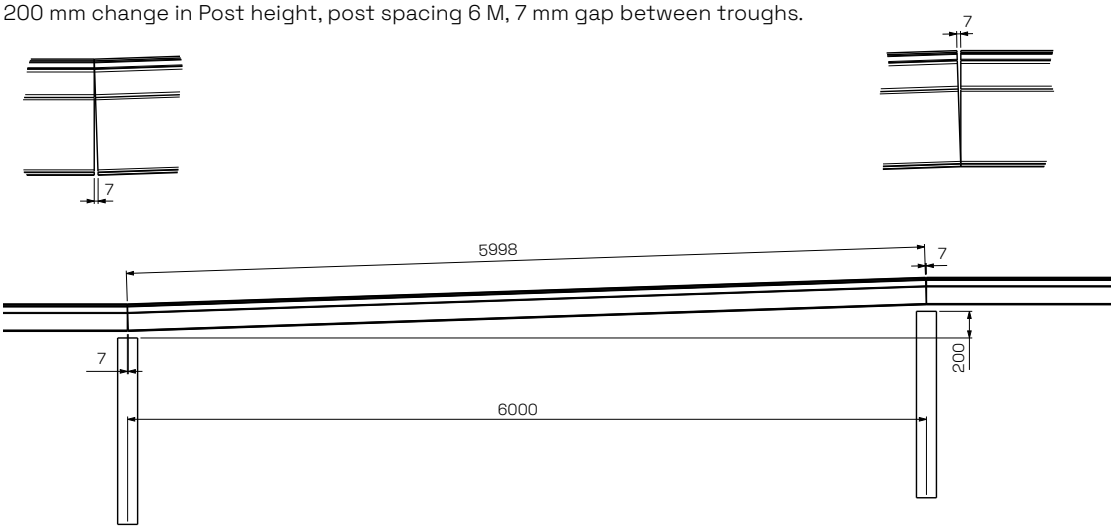
Trough Installation

Under normal circumstance, minor changes in route height and direction can be accommodated without special consideration. For example when running along level ground with small localised changes in level or when changing direction to follow a curved rail track.
For circumstances that require larger changes in direction or height then there are number of guidelines that should be followed.

Changes in height of troughing

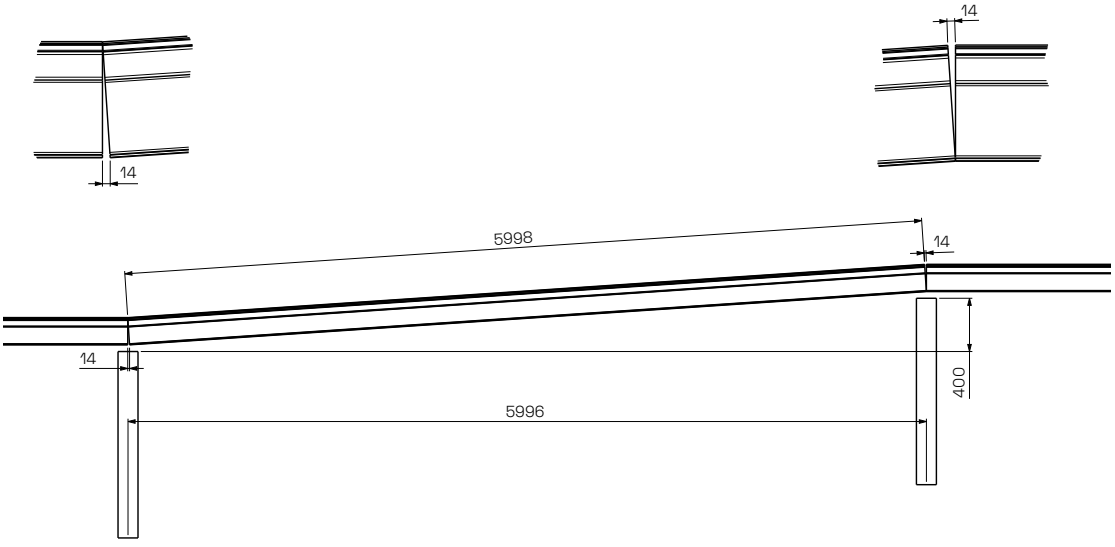
The Top Post Mounting has a height adjustment of 50mm to ensure that a level route can be achieved even if the posts are not set at exactly the same height. In instances where a level route cannot be achieved due to large variance in ground levels, then distance in post spacing and angle cutting troughs need to be considered. For changes in post height up to approximately 200mm over a 6 metre length then no special measures are needed.

200 mm change in Post height, post spacing 6 M, 7 mm gap between troughs.



For changes in post height greater than 200mm over a 6 metre length then gap between lengths is increased and effective distance between posts is decreased. In this situation it is recommended to cut ends of trough to required angle and decrease distance between posts by at least 100mm.

400 mm change in Post height, post spacing 5996 mm, 14 mm gap between troughs.

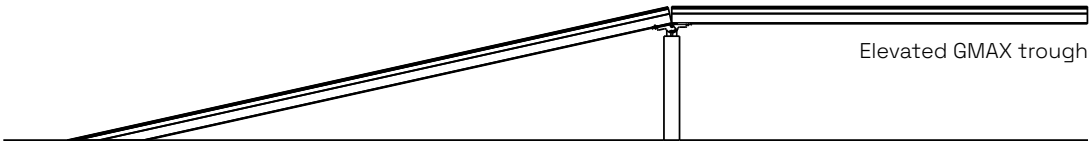


Trough Installation

Elevated GMAX trough to Concrete ground trough

For cable routes that end or begin at ground level. Use the Adjustable Top mount Bracket(PM100, PM200) or Adjustable Cantilever Bracket(CB100, CB200) to allow necessary incline of GMAX trough.

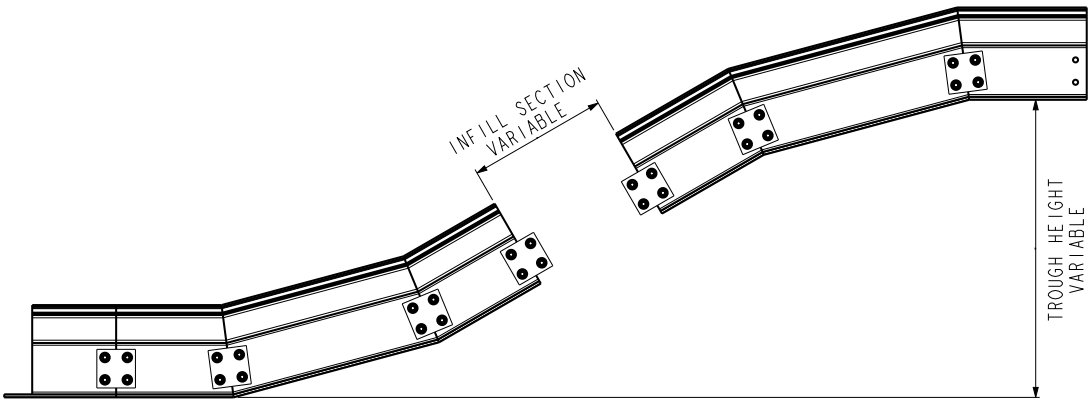
Limit change in angle to less than 15 degrees to minimise stress in cable. Check cable manufacturers specification.



Connection to
ground trough.

GMAX Elevated to Concrete adaptor (GMXCTA100, GMXCTA200)

For cable routes that begin or end at ground level and have space limitations where a long inclined trough cannot be fitted. Use GMAX Elevated to Concrete adaptor



Join to under gound trough and seal gap with concrete banking.

Infill Section not supplied with this kit. Use an offcut of GMAX Trough or cut from a complete length.
Length of **infill section** can be calculated using the following formular: (TROUGH HEIGHT – 407) multiplied by 2

Trough installation

Angle adjustment

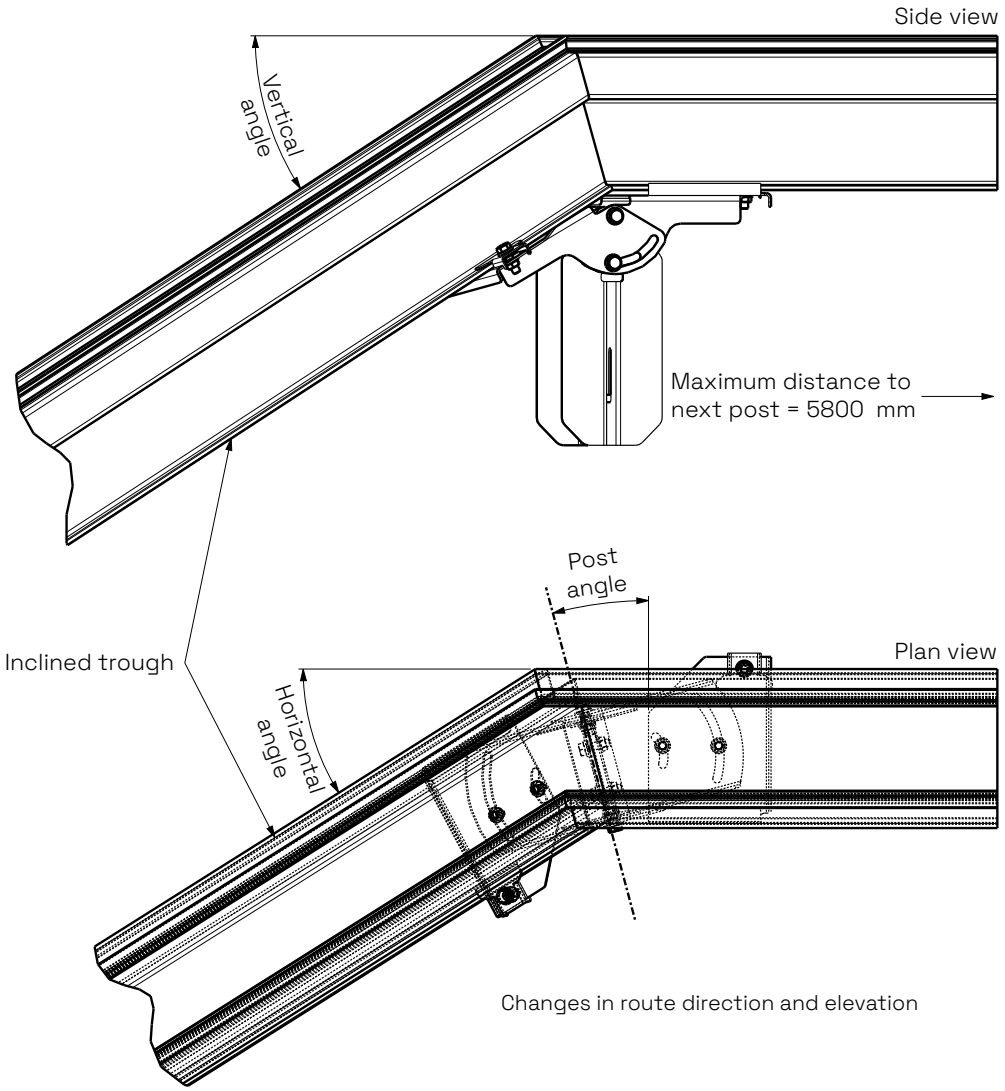
GMAX brackets offer large amounts of angular adjustability and are ideal for installations that require complicated route changes to clear obstructions/changes in levels etc. Both Adjustable Top Mounting and Cantilever Brackets allow for a maximum of 30° angular adjustment in vertical and horizontal planes.

Large angle adjustments simultaneously in both horizontal and vertical planes will result in uneven loading on the trough and therefore limits have been set on allowable span of troughs as they run between the change in orientation.

Inclined trough lengths should adhere to the following rules.

Vert angle+Horiz angle adjustment < 40 then Max Inclined Trough span = 3M

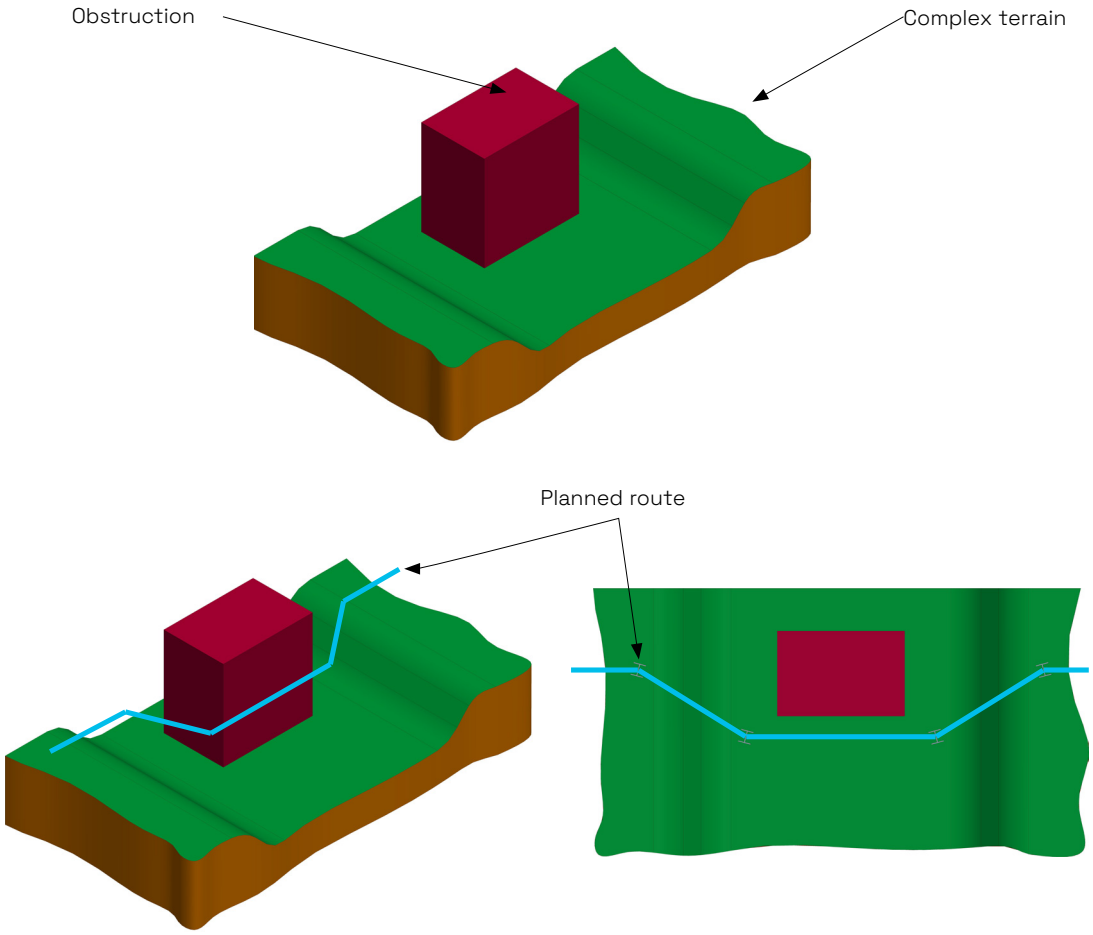
Vert angle+Horiz angle adjustment < 60 then Max Inclined Trough span = 1M



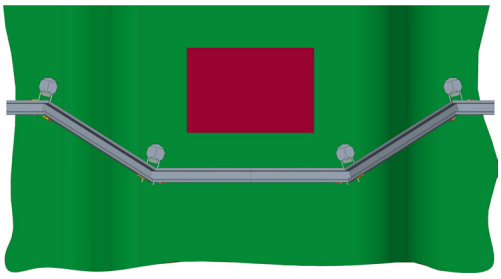
Changes in route direction and elevation

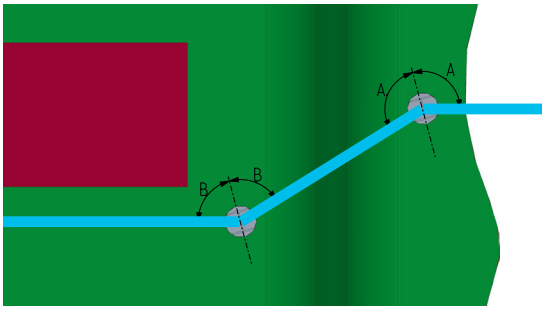
Trough installation

Method of angle adjustment



Mark out positions of post holes ensuring that maximum horizontal angle is not exceeded per change of direction. Dig out holes to neccessary depth and insert posts, temporarily fix posts vertically and at required height. Run a string line across the top of of the posts and check maximum vertical angle is not exceeded. Spin posts so that centre line of post bisects bend line equally

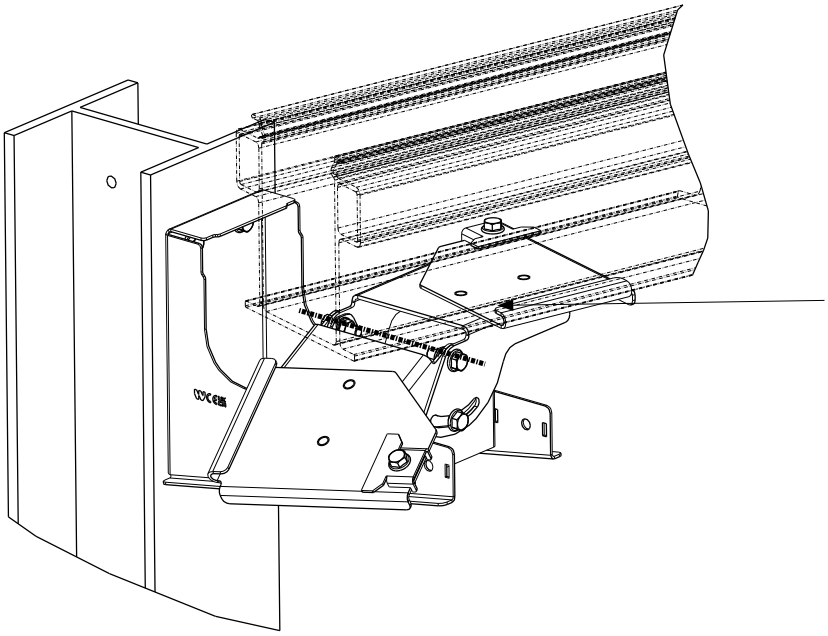




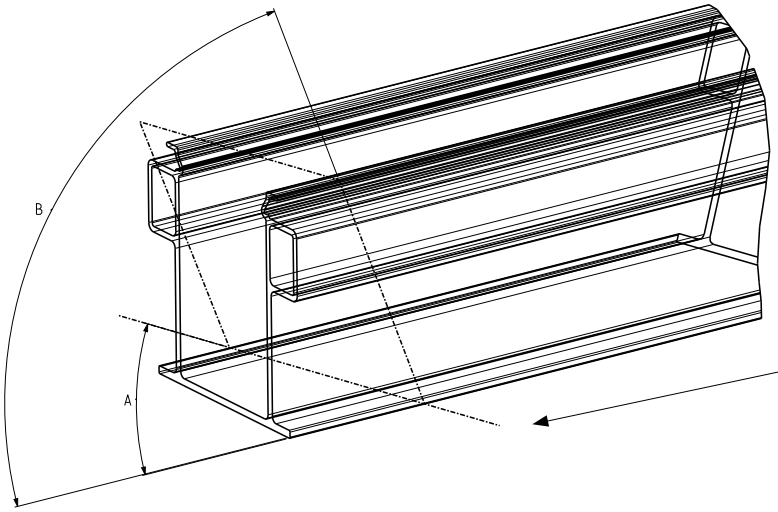
Note see page 21 for maximum vertical and horizontal angles

Trough installation

Permanently embed posts into post holes using preferred method of infill. Fit Bracket to post and position support plates at roughly the required angles. Loosely fit troughing onto support plates and scribe a line on the base of the trough inline with the hinged axis of the bracket.



Axis of bracket used as a guide to scribe a line on the base of the trough.



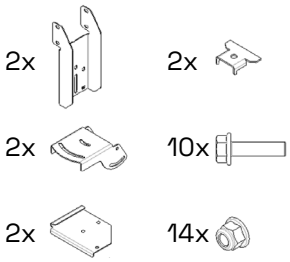
Angle “A” = Half of horizontal bend angle
Angle “B” = Half of vertical bend angle.
Mark out cut line where possible on outer walls of tray and cut compound angle.

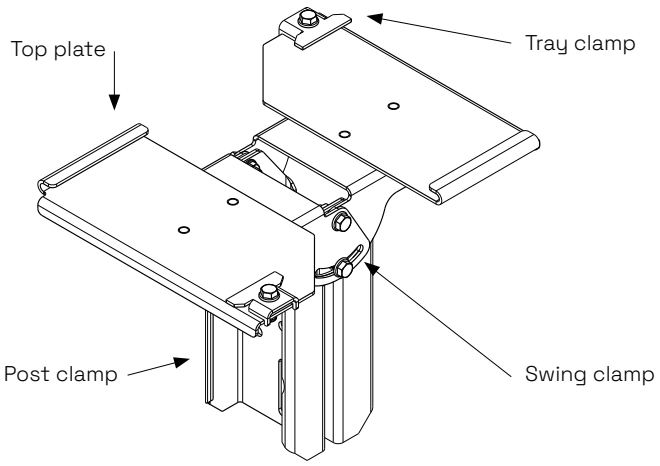
Scribed line

Repeat procedure for next trough. Ensure cut is accurate without excessive gap between lengths

Trough installation

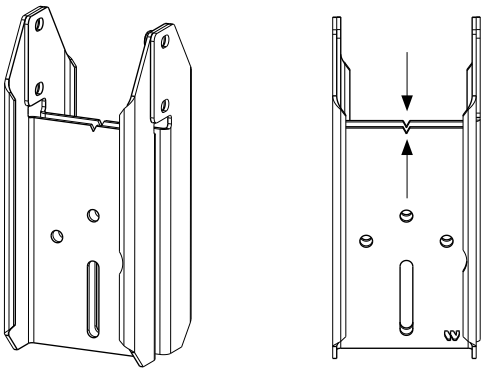
Adjustable top mounting bracket PM100/PM200

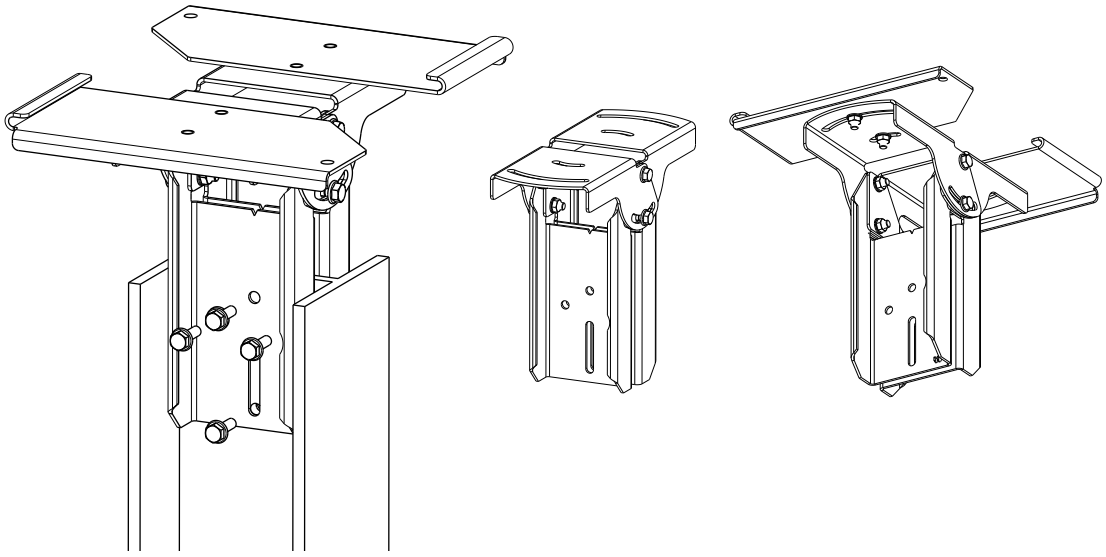




1) Pre-Assemble the post clamps:
   - Align the notches for the clamps.
   - Loosely assemble parts.
   Swing plates with 4 nuts/bolts
   Top Plates to the swing plates with 2 nuts.

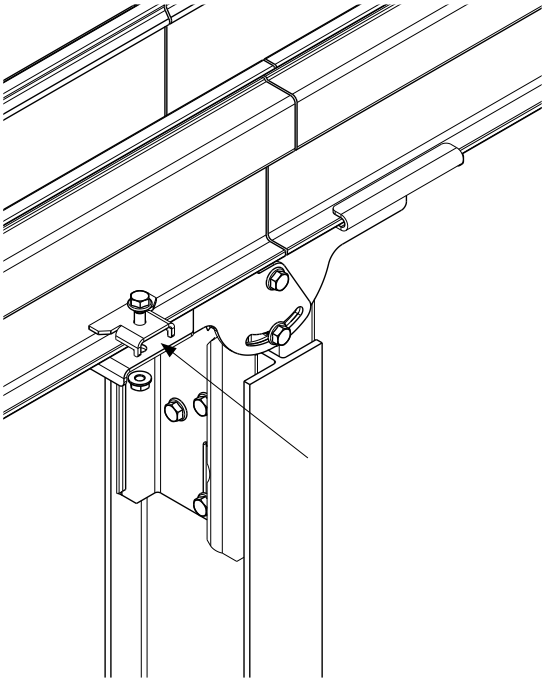
   Pre-assemble parts on the post:
   Position the assembly around the centre of the post
   Bolt through slots in Post clamps and holes in post. The Clamps provide 50mm of vertical adjustment to compensate for the differences in level between the posts.
   Set height and torque to 24N.m



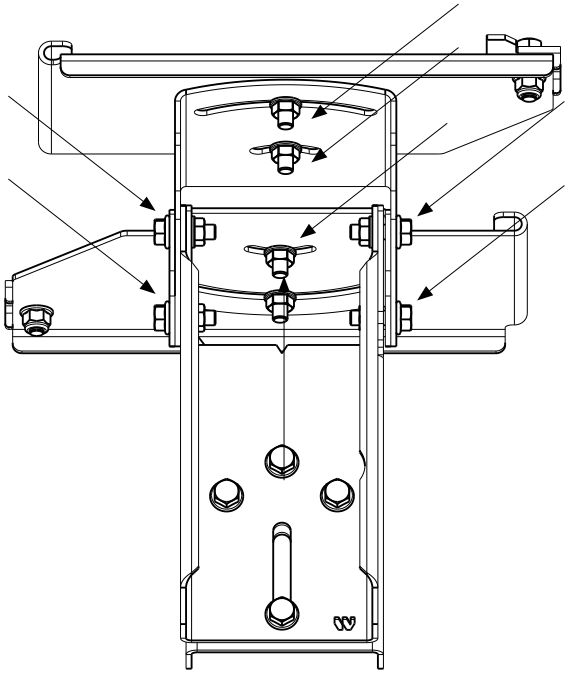


Trough installation

2) Place the trays. An Expansion gap of 2mm needs to be left between the trays. Fit Clamps. Torque the clamp bolts to 10N.m

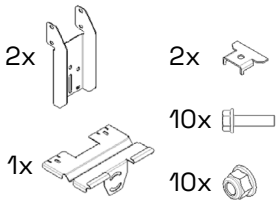


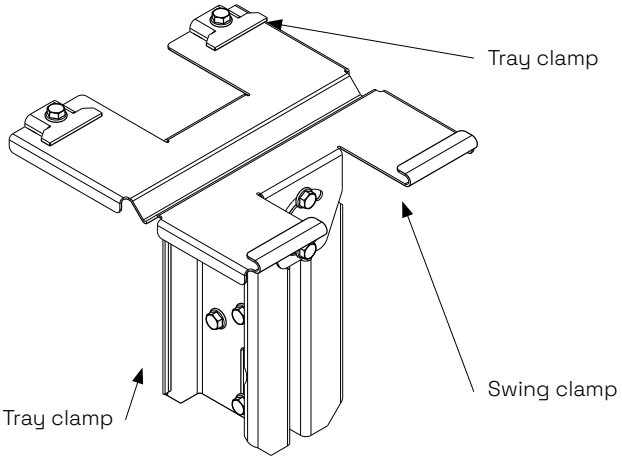
3) When Troughs are fitted to supports and there is no tension in the system, torque the nuts Indicated below to 24N.m



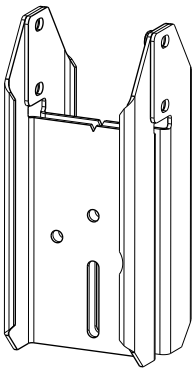
Trough installation

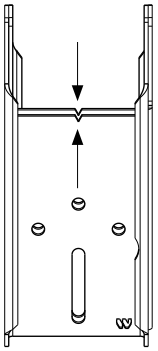
Inclined top mounting bracket RB100, RB200

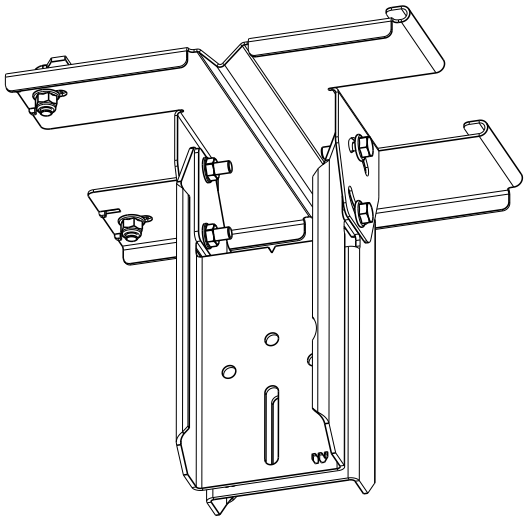




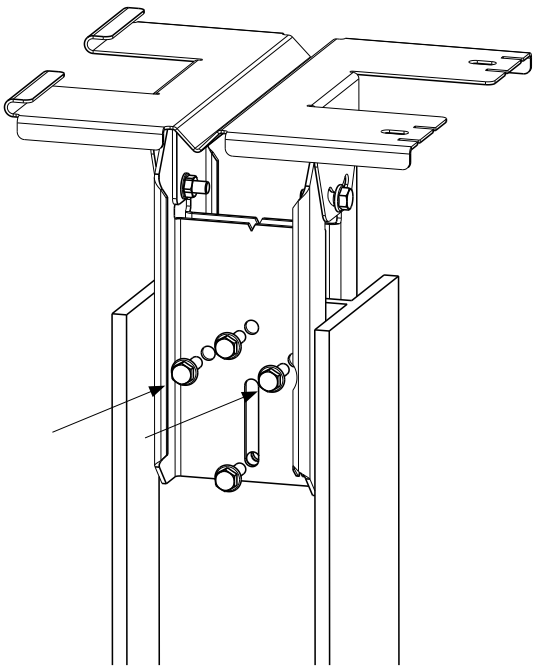
1) Pre-Assemble the post clamps and the Swing plate:
   - Align the notches for the clamps.
   - Loosely assemble parts.
   Swing plates with 4 nuts/bolts.





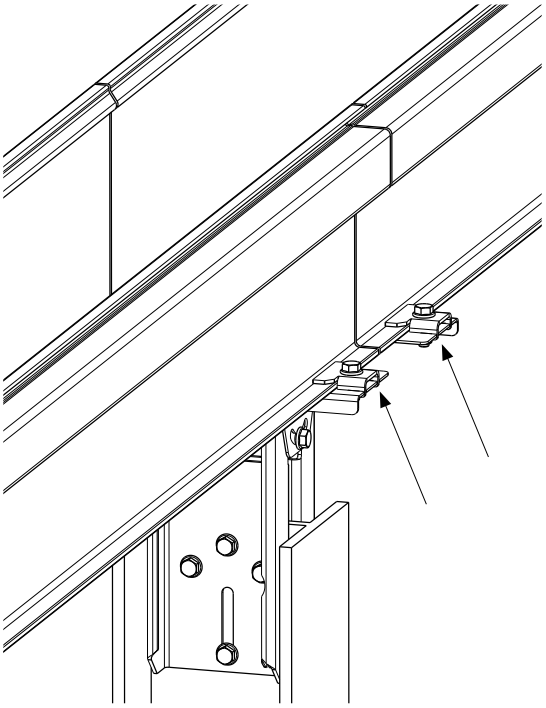


2) Pre-assembled parts on post.
   Position the assembly around the centre of the post.
   Bolt through slots in Post clamps and holes in post.
   The Clamps provide 50mm of vertical Adjustment to compensate for the differences in level between the posts.
   Set height and torque to 24N.m

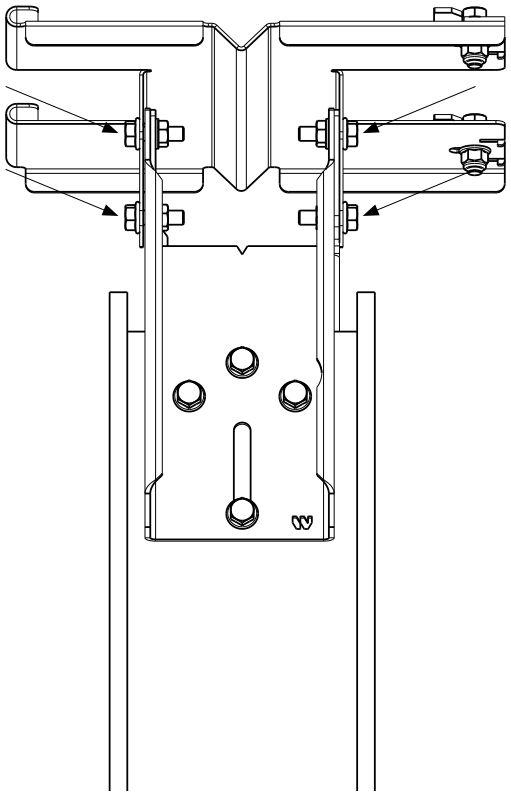


Trough installation

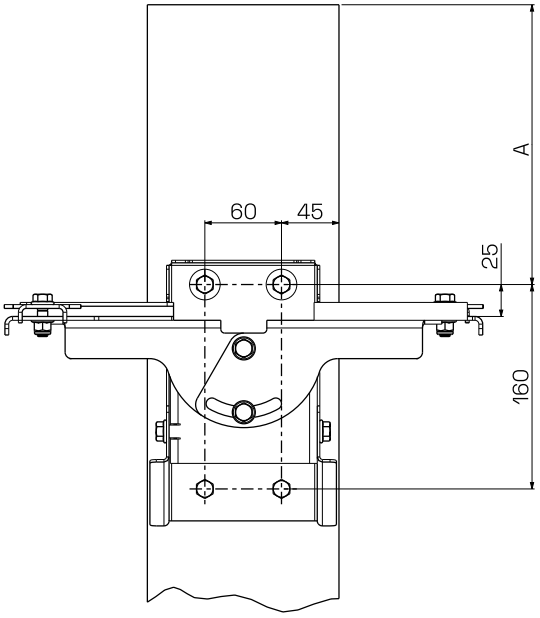
3) Place the trays. An expansion gap of 2mm needs to be left between the trays. Torque the clamp bolts to 10N.m



4) When Troughs are fitted to supports, ensure there is no residual tension in the system and torque the nuts indicated below to 24N.m

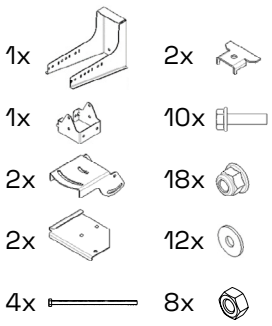


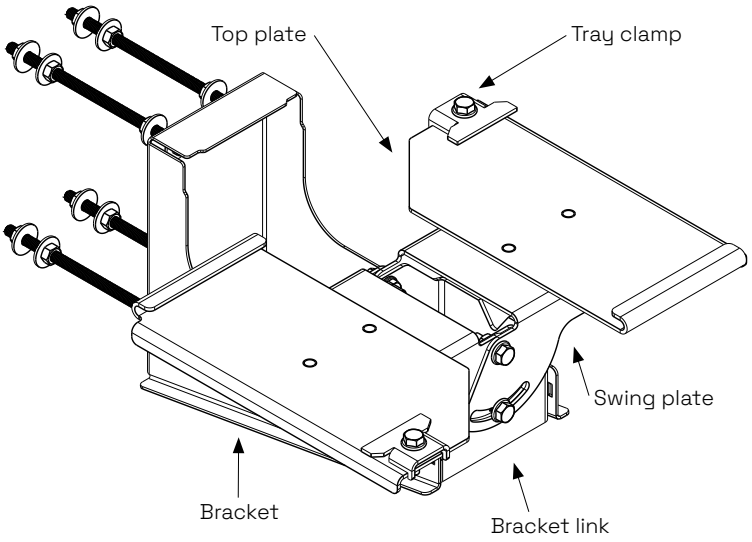
Adjustable cantilever bracket CB100, CB200



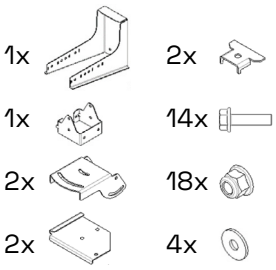
Preparation: Drill the post with a Ø9mm drill according to diagram above:
A>230mm.
The cantilever can be pre-assembled or assembled on the post.

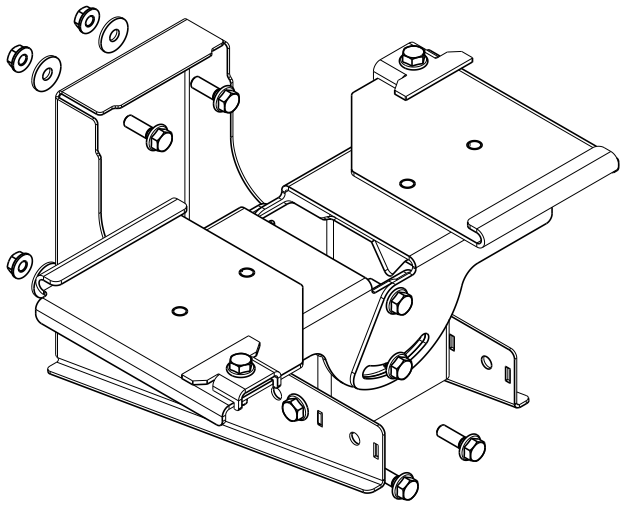
CB200





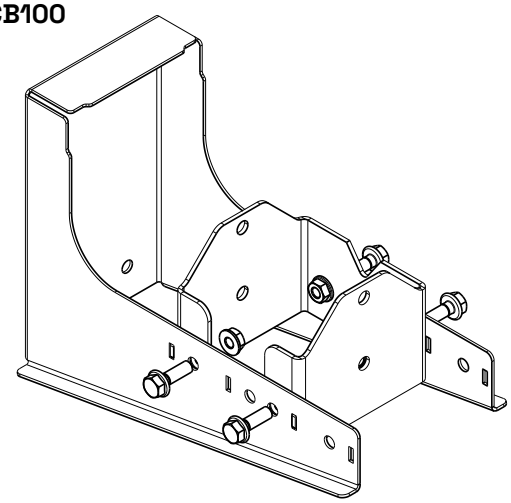
CB100

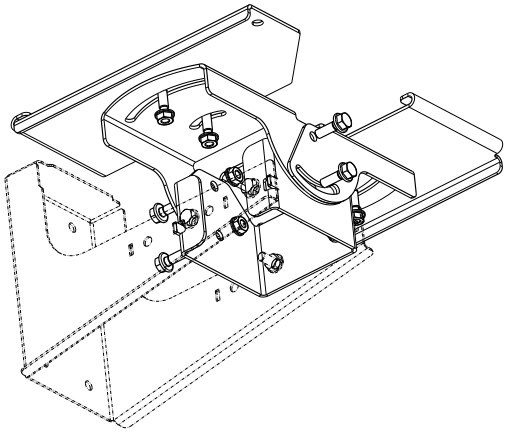




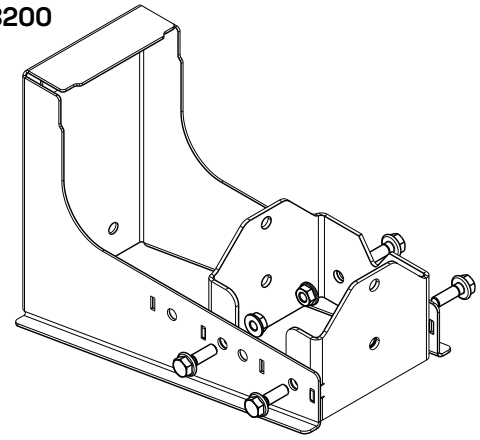
Trough installation

CB100

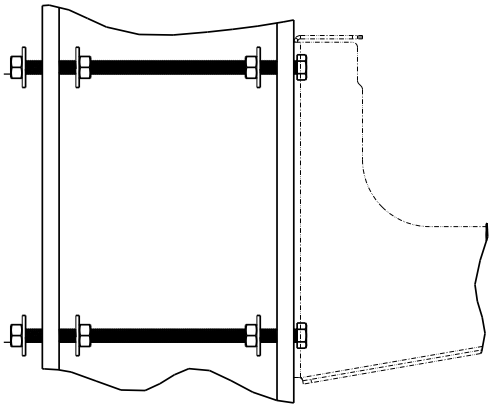




CB200



CB200 fitting to post



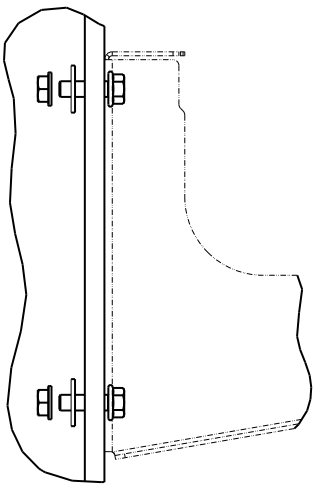
1) Assemble the bracket link on the bracket with 4 nuts/bolts: torque 24N.m

   Note: The bracket link can be placed in 2 positions. As shown for above for 200x200 Trough. Closer to post for 100x160 Trough

2) Loosely assemble parts.
   Swing plates with 4 nuts/bolts
   Top Plates to Swing Plates with 2 nuts on each.

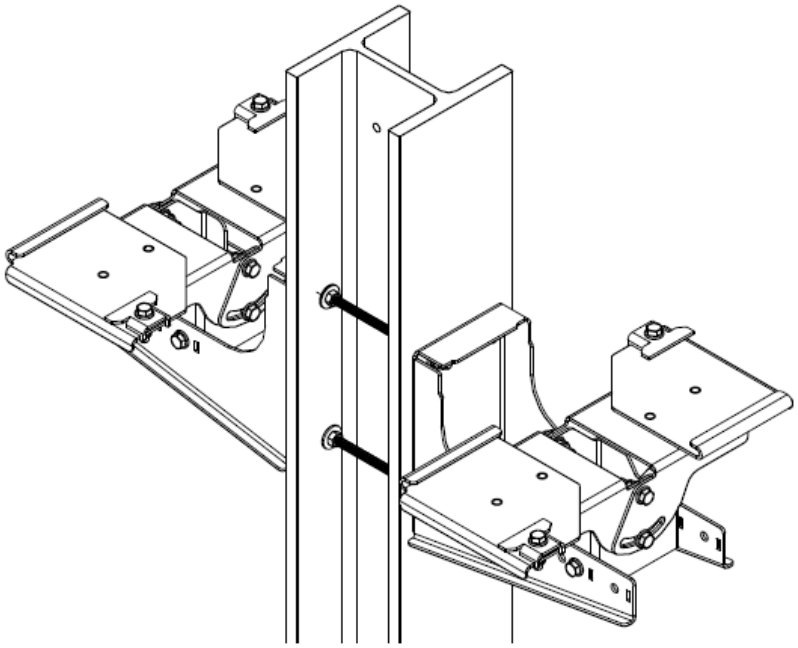
   Fit Cantilever to post, ensure washer/nut position is as shown depending on size of trough. Torque bolts to 24N/m

CB100 fitting to post

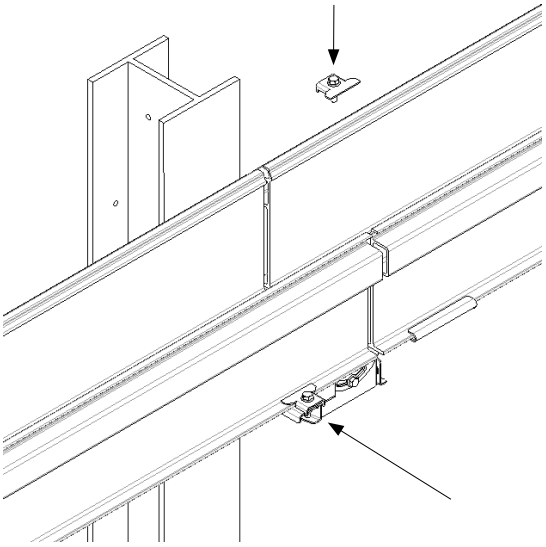


Trough installation

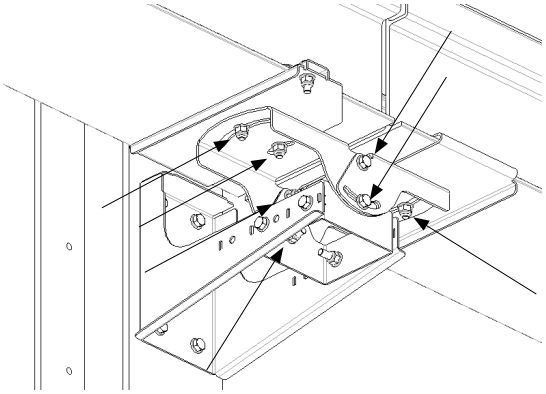
Two Cantilevers fitting to post



4) Place the trays. A gap of 2mm need to be left between the trays
Torque the clamp bolts to 10N.m



5) Ensure there is no residual tension in troughs and torque nuts to 24N.m



Appendix 1 - Fire performance

Polyester class 1 resin (PY1)	
BS 476 Part 7 (1997)	Surface Spread of Flame
UL94 V0	50W Vertical Burning Test
UL94 5VA	500W Vertical Burning Test
BS EN60695-2-12: 2001	960 Glow Wire

Acrylic resin (MX)	
BS 476 Part 7 (1997)	Surface Spread of Flame
BS 476 Part 6 (1989)	Fire Propagation
BS 6853 App D Clause D.8.4 (1999)	Smoke Density
BS 6853 Annex B.2 (1999)	Area Based Toxic Fume
NES 713	Toxicity Index
UL94 V0	50W Vertical Burning Test
UL94 5VA	500W Vertical Burning Test
NFX70-100	Toxicity Index
BS EN 60695-2-12: 2001	960 Glow Wire
BS EN 50642:2018	Halogen free

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