FORTEC AUSTRALIA

MK4

Innovative Solutions

GROUND ANCHORS

GROUND ANCHORS

MK4 ground anchors have been designed to cover a wide range of possible applications and hence are able to fulfil any project requirements. They have been designed according to the "Recommendations for the Construction Project anj anchors ground control", been Mekano4 member of the FIB.
Following the same recommendations, load and suitability tests are performed.

TENDONS

TEMPORARY: Anchors with a working life of less than 9 months. The main components of these anchors are post tensioning steel strands, with bonding capability in the fixed length and are self-protected in the free length. These anchors have only one grout injection tube. The tendon remains centered and separated from the walls of the borehole by centralisers.

PERMANENT: Anchors with a working life greater than 9 months which require special protection. The main components of these anchors are post tensioning steel strands, with bonding capability in the fixed length and are self-protected in the free length. The tendon has an outer corrugated duct along its full length. For the primary injection two pipes are installed inside the corrugated duct.

TENDON: The main components of these anchors are post tensioning steel strands, self-protected all along their entire length with grease and individual high density Polyethylene (HOPE) duct. The tendon has an outside smooth HDPE duct along its full length. The space between individual and outside duct, might be sealed with grout or grease, depending on the project requirements.

ANCHOR HEADS

MK4 produces standardized anchor heads for the ground anchors with inclinations that range from Oo to 45o. The anchor plates are designed for an efficiency of 95 % of the strand breaking load and the bearing plates transfer less than 25 N/mm2 compression pressures to the structure. Nevertheless, special plates can be designed and adapted to the requested angle and design.

STRESSING PROCEDURE - The standard MK4 heads for temporary and permanent anchors can be stressed with Arrow jacks, MS1, MS2, MS3, depending on the anchor size.

LOAD CELLS - MK4 supplies load cells that can be placed between the anchor plate and the distribution plate allowing load reading measurements.

RESTRESSABILITY - MK4 has developed anchor heads that are restressable; this allows the control the anchors load with threaded jacks, not needing the installation of load cells. These anchors allow to increase the load of the anchorage using the site wedges.

LOAD CONTROL - If restressable anchors are needed requiring a variation of bad applied in stressing or unstressing, adjustable heads exist which are designed specifically for each application.

TENDON COMPONENTS AND ANCHOR HEADS

QUALITY CONTROL

MK4 sends to the client, automatically, once the product is delivered, the corresponding documentation relative to the quality of the components and the manufacturing control, following Mk4's own General Plan of Insurance of Quality, certified according to ISO 9001:2000.

Tendon Components for Ground Anchors

ITEM/COMPONENT	TEMPORARY ANCHORS		PERMANENT ANCHORS	
	Standard Tendon	Regroutable Anchor	Standard Tendon	Regroutable Anchor
Strand diameter	0,6"	0,6"	0,6"	0,6"
HDPE strand	Free length	Free length	Free length	Free length
unbonded strand	Free length	Free length	Free length	Free length
Strand spacer	Anchor length each 1,5 m	Anchor length each 1,5 m	Anchor length each 1,5 m	Anchor length each 1,5 m
Tendon spacer	Anchor length each 1,5 m	Anchor length each 1,5 m	Anchor length each 2 m	Anchor length each 2 m
Corrugated duct	-	-	Full length	Full length
Head	metallic	metallic	Polyethylene	Polyethylene
External primary injection	-	-	1 tube Ø20	1 tube Ø20
Internal primary injection	-	-	1 tube Ø20 1 tube Ø13 to 3/0.6"	1 tube Ø20
Standard primary injection	1 tube Ø20	-	-	-
regrouting	-	1 tube Ø32	-	-

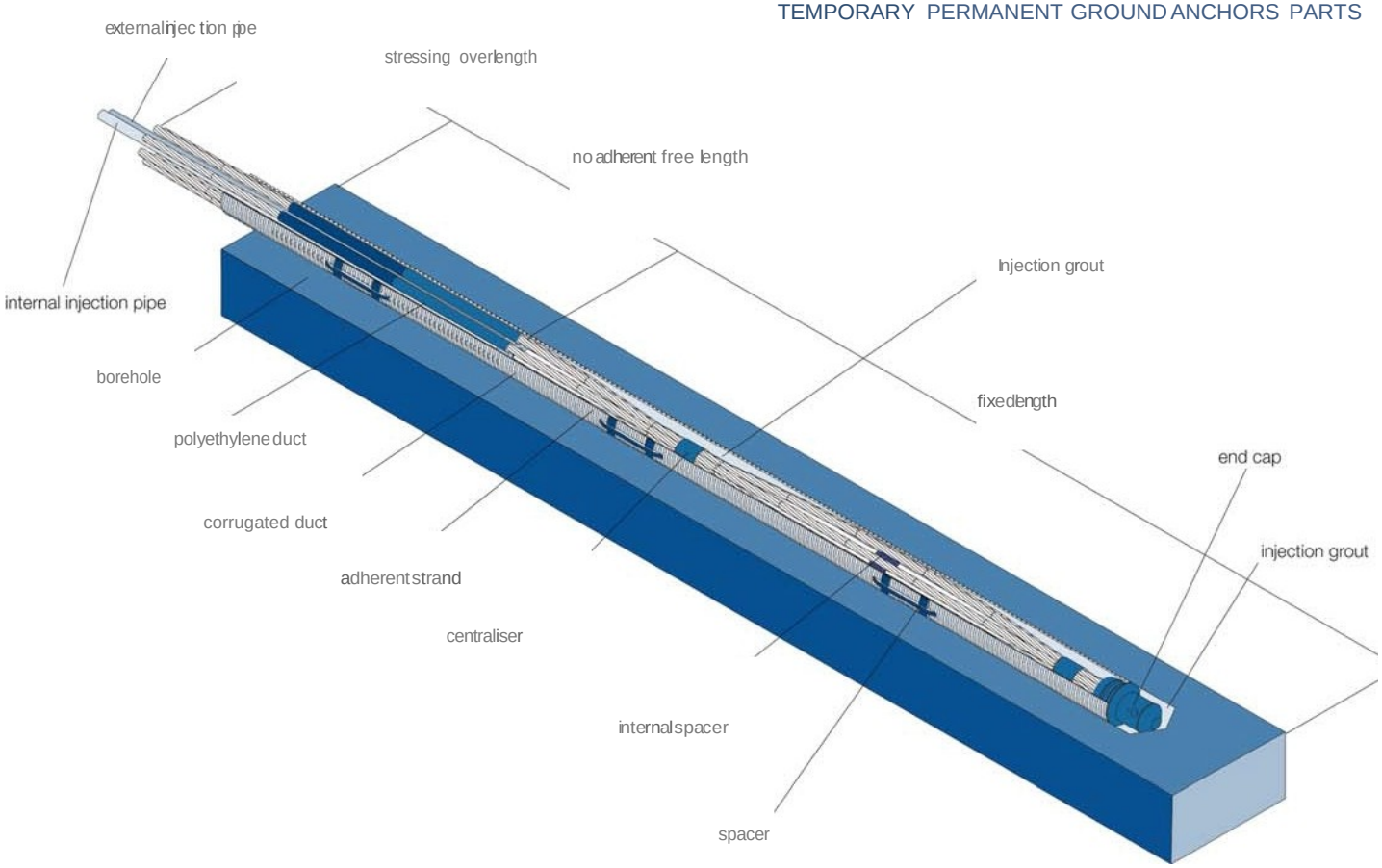
Anchor Head Components

ITEM/COMPONENT	TEMPORARY ANCHORS	PERMANENT ANCHORS		
	Standar Bearing plate	Standar Bearing plate	"restressable" anchor head	Adjustable Bearing plate
Grout cap	-	Standard	Standard	Adjustable Anchor
Grounting cap grease	-	Standard	Standard	Standard
Wedge	0,6"	0,6"	0,6"	0,6"
Anchor plate	Standard	Standard	"Restressable"	Adjustable Anchor
Adjustable nut	-	-	-	Adjustable Anchor
Diaphragm	-	Standard	Standard	Adjustable Anchor
Thimble	-	0,6"	0,6"	0,6"
Sealing joint	-	Standard	Standard	Standard
Distribution plate	Standard	Standard	"Restressable" Anchor	Adjustable Anchor

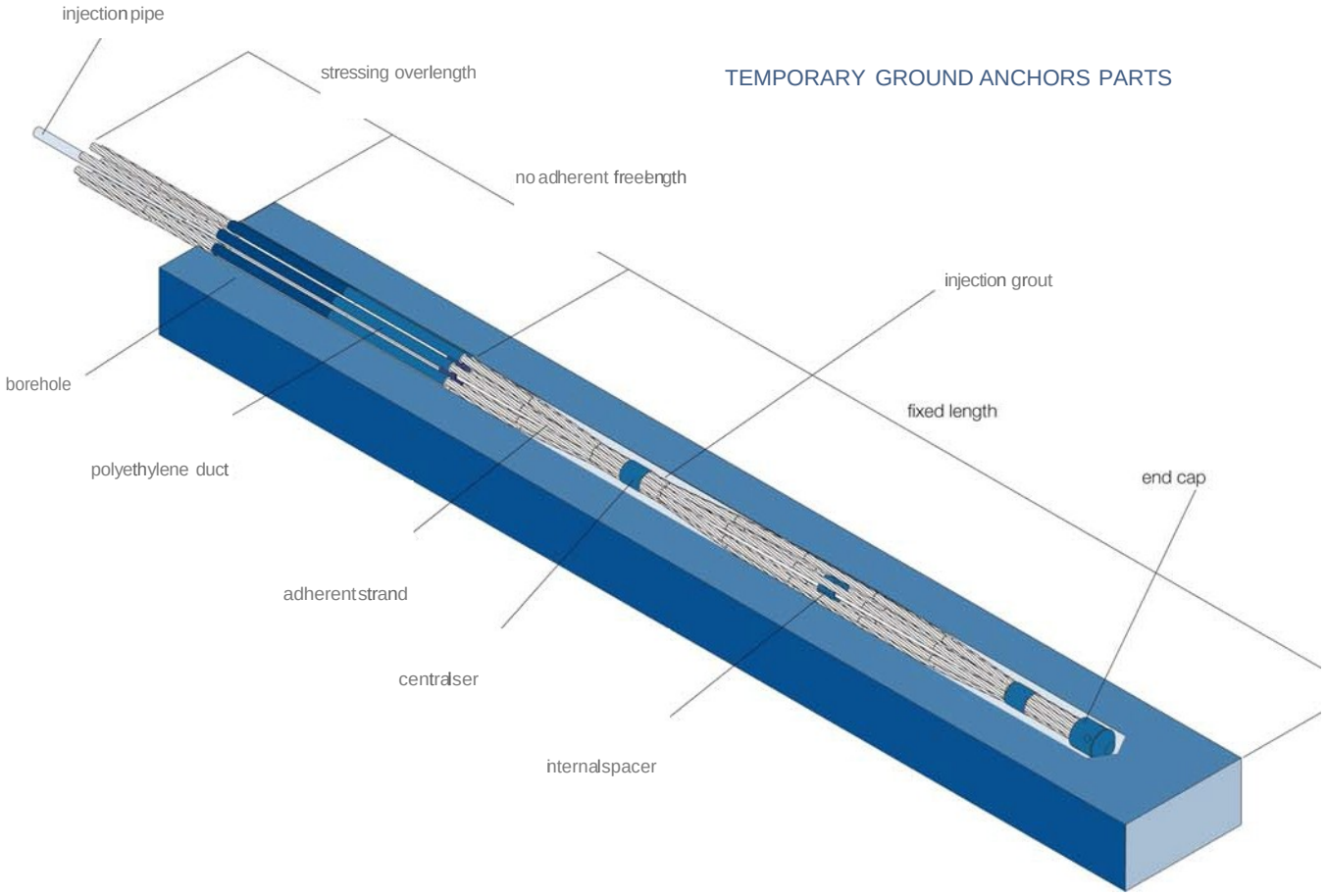
Note: If load cells are use the distribution plate and the grouting cap should be modified.
The adjustable heads are specific for each application and are not listed on these tables.

TENDON COMPONENTS AND ANCHOR HEADS

TEMPORARY PERMANENT GROUND ANCHORS PARTS

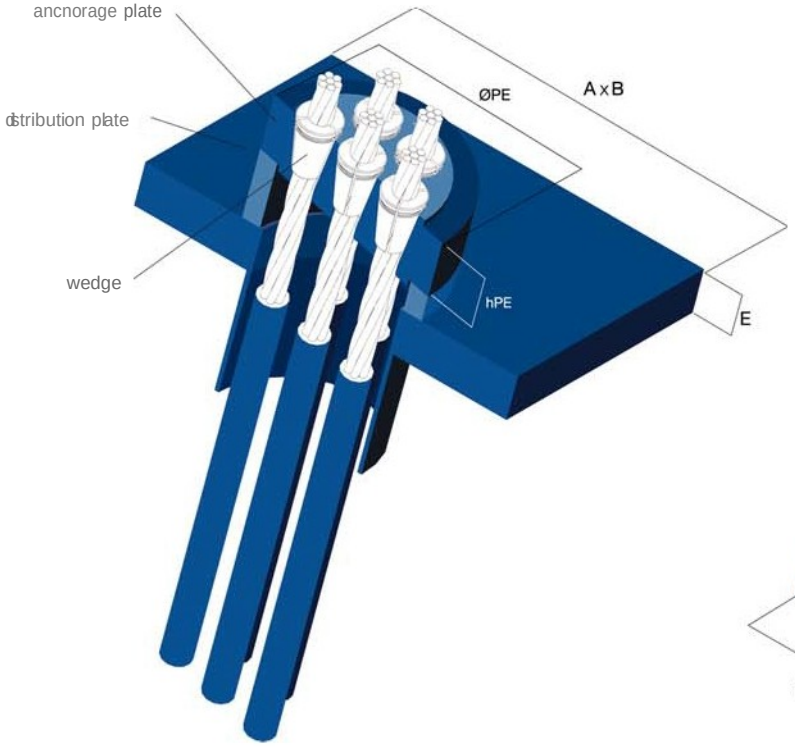


TEMPORARY GROUND ANCHORS PARTS

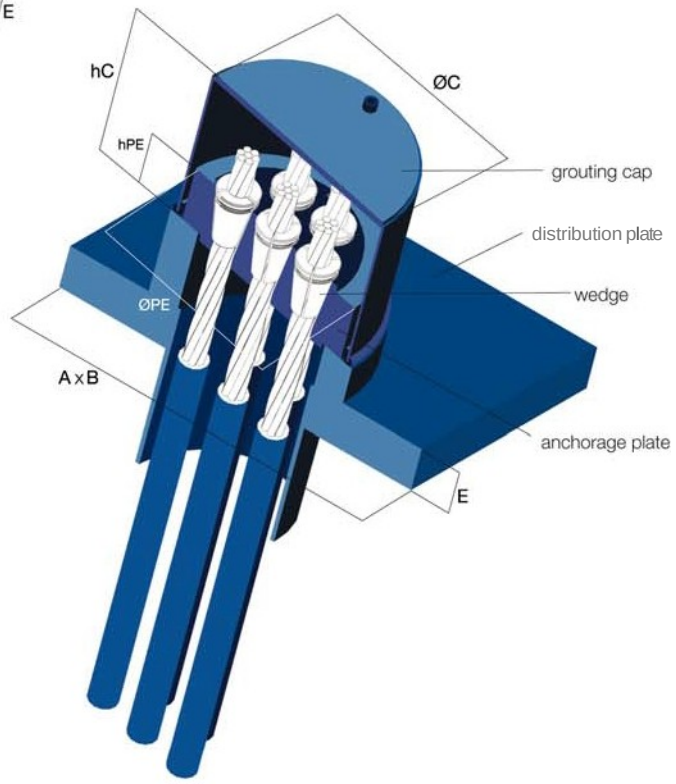


ANCHOR HEADS

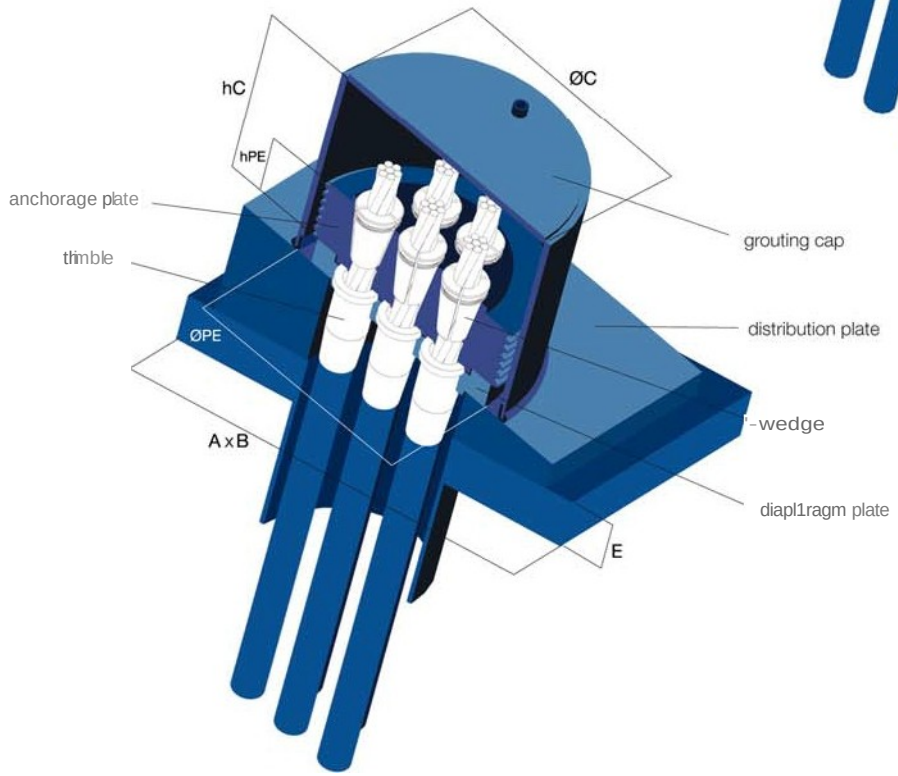
TEMPORARY ANCHOR HEADS



PERMANENT ANCHOR HEAD



"RESTRESSABLE" BEARING PLATE



Anchor Head - Summary of Components, Equipments and Dimensions

ANCHORAGE		ANCHOR PLATE		DISTRIBUTION PLATE				GROUT CAP		STRESSING EQUIPMENT	
Tendon	Serie	ØPE	hPE	A	B	E	ØTE	ØC	hC	Jack	Hydraulic Pump
2/0.6"	D	110	55	250/300	250	30	108	-	-	MS1	BPT11
	DP							127	125		
	DR		61								
3/0.6"	D		55					-	-		
	DP							127	125		
	DR		61								
4/0.6"	D		55					-	-		
	DP							127	125		
	DR		61								
5/0.6"	D	140	55	300/320	300	35	127	-	-	MS2	
	DP							152	125		
	DR	150						168,3	147		
6/0.6"	D	140						-	-		
	DP							152	125		
	DR	150						168,3	147		
7/0.6"	D	140						-	-		
	DP							152	125		
	DR	150						168,3	147		
8/0.6"	D	158	65	330/340	330	45	132	-	-	MS3	
	DP							168	151		
	DR	180						219	160		
9/0.6"	D	158						-	-		
	DP							168	151		
	DR	180						219	160		
10/0.6"	D	172	77	375/410	375	55	155	-	-		
	DP							188	171		
	DR	190						219	171		
11/0.6"	D	172						-	-		
	DP							188	171		
	DR	190						219	171		
12/0.6"	D	172						-	-		
	DP							188	171		
	DR	190						219	171		

Note: the distribution plate can be supplied with inclination angles that range from 0° to 30°

TENDON PROPERTIES

Ground Anchor Tendons Mechanical Properties

	STRAND 0.6" - 15.2 mm			STRAND 0.62" - 15.7 mm			MAXIMUM STRESSING FORCES (To)			
Type	Cross Section	Breaking Load	Yield load at 0,1 %	Cross Section	Breaking Load	Yield load at 0,1 %	Temporary Anchors 0.6"	Permanent Anchors 0.6"	Temporary Anchors 0.62"	Permanent Anchors 0.62"
	mm²	kN	kN	mm²	kN	kN	0.70Ts (kN)	0.60Ty (kN)	0.70Ts (kN)	0.60Ty (kN)
2/0.6"	280	520	448	300	558	480	364	269	391	288
3/0.6"	420	780	672	450	837	720	546	403	586	432
4/0.6"	560	1040	896	600	1116	960	728	538	781	576
5/0.6"	700	1300	1120	750	1395	1200	910	672	977	720
6/0.6"	840	1560	1344	900	1674	1440	1092	806	1172	864
7/0.6"	980	1820	1568	1050	1953	1680	1274	941	1367	1008
8/0.6"	1120	2080	1792	1200	2232	1920	1456	1075	1562	1152
9/0.6"	1260	2340	2016	1350	2511	2160	1638	1210	1758	1296
10/0.6"	1400	2600	2240	1500	2790	2400	1820	1344	1953	1440
11/0.6"	1540	2860	2464	1650	3069	2640	2002	1478	2148	1584
12/0.6"	1680	3120	2688	1800	3348	2880	2184	1613	2344	1728

Temporary Tendons for Ground Anchors

Type	Cross Section mm²	Maximum Stressing Load To (kN)	Coupler Fix Zone (type)	Tendon external Diameter with spacer (mm)	Minimum borehole Diameter Dp (mm)	Tendon Weight Kg/m
2/0.6"	280	364	4	85	114	2.6
3/0.6"	420	546	4	85	114	3.9
4/0.6"	560	728	7	100	133	5.2
5/0.6"	700	910	7	100	133	6.5
6/0.6"	840	1092	12	115	152	7.8
7/0.6"	980	1274	12	115	152	9.1
8/0.6"	1120	1456	12	115	152	10.4
9/0.6"	1260	1638	12	115	152	11.7
10/0.6"	1400	1820	12	115	152	13.0
11/0.6"	1540	2002	12	115	152	14.3
12/0.6"	1680	2184	12	115	152	15.6

Permanent Tendons for Ground Anchors

Type	Cross Section mm²	Maximum Stressing Load To (kN)	Corrugated duct De/Di (mm)	Tendon external Diameter with spacer (mm)		Minimum borehole Diameter Dp (mm)		Tendon Weight Kg/m
				With Spacer	With a reinjectable System	With Spacer	With a reinjectable System	
2/0.6"	280	269	65/55	95	110	114	133	2.6
3/0.6"	420	403	80/71	110	125	133	133	3.9
4/0.6"	560	538	80/71	110	125	133	133	5.2
5/0.6"	700	672	80/71	110	125	133	133	6.5
6/0.6"	840	806	100/86	130	145	152	152	7.8
7/0.6"	980	941	100/86	130	145	152	152	9.1
8/0.6"	1120	1075	100/86	130	145	152	152	10.4
9/0.6"	1260	1210	100/86	130	145	152	152	11.7
10/0.6"	1400	1344	100/86	130	145	152	152	13.0
11/0.6"	1540	1478	100/86	130	145	152	152	14.3
12/0.6"	1680	1613	110/100	140	155	152	178	15.6

Horizontal Anchors Tendons

Type	Cross Section mm²	Maximum Stressing Load To (kN)	External tendon diameter De (mm)	Smooth HDPE duct (mm) Di (mm)	Grounting Weight (Kg/m)	Tendon Weight Kg/m
2/0.6"	280	269	63	56	2.8	3.4
3/0.6"	420	403	75	66	3.9	5.0
4/0.6"	560	538	90	80	5.7	6.7
5/0.6"	700	672	90	80	5.2	8.0
6/0.6"	840	806	110	97	8.4	10.0
7/0.6"	980	941	110	97	8	11.3

FORTEC AUSTRALIA

ABN 77 603 299 958

HEAD OFFICE
108 Motivation Drive
Wangara WA 6065
T 08 6267 2370

PO Box 1384
Wangara WA 6947
info@fortecaustralia.com.au

KALGOORLIE
Lot 33 Yarri Road
Parkeston WA 6433
T 08 9021 5277

KARRATHA
1/3890 Coolawanyah Road
Karratha WA 6714
T 08 9185 6077

PORT HEDLAND
11 Pinga Street
Port Hedland WA 6721
T 08 9185 6077

DARWIN
30 Muramats Road
East Arm NT 0822
T 08 8901 7760

MELBOURNE
93-97 Remington Drive
Dandenong South VIC 3175
T 03 8787 5865

SYDNEY
Unit 59, 7-9 Percy Street
Auburn NSW 2144
T 02 8203 3860

WWW.FORTECAUSTRALIA.COM.AU

MK4
Innovative Solutions

MeKano4, S.A.

www.mekano4.com

BARCELONA
Headquaters

Carretera Rubí 72-74
Edificio Horizon
08190 Sant Cugat del Vallés

Tel. +34 918 049 260
Fax +34 918 032 864

mk4@mekano4.com

MADRID

Plaza Labradores 1
Planta 4, Oficina 1
28760 Tres Cantos

Tel. +34 902 193 569
Fax +34 918 032 864

mk4_mdr@mekano4.com