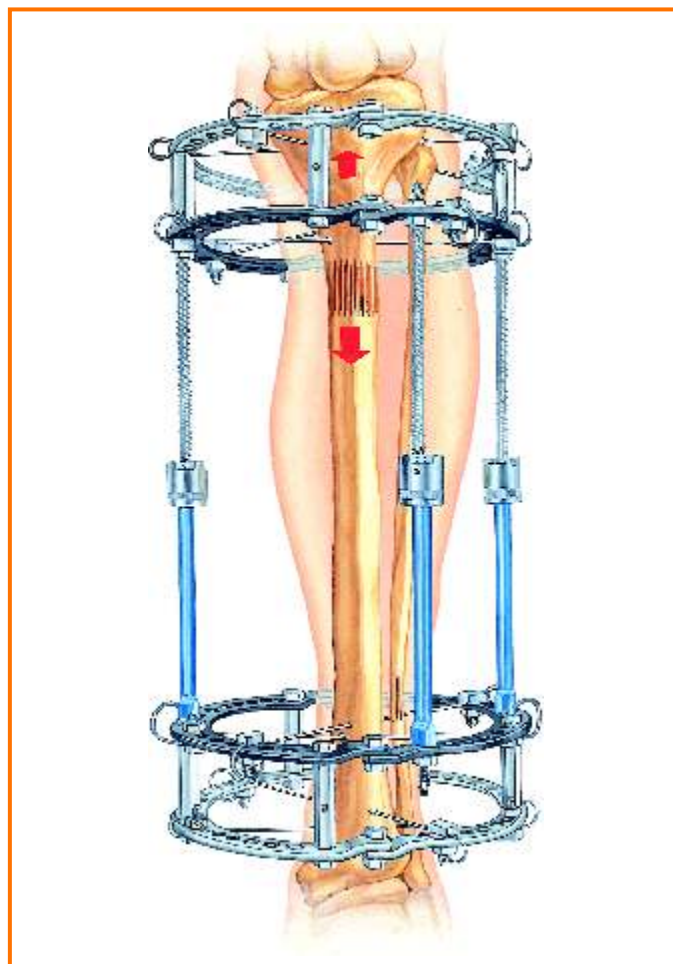


# THE RING FIXATOR SYSTEM



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PITKARS

## MAINTENANCE OF THE APPARATUS

The apparatus consists of various forms of stainless steel. It is very resistant to mechanical loading if properly assembled. Because the apparatus is used for a long time on patients, equipment integrity is of maximum concern. It is necessary to use a disinfectant cleaning solution that is well tolerated by the stainless steel material. It is also important to protect the equipment with a layer of neutral vaseline or to use a silicone spray that will not produce a skin reaction. The equipment is made to withstand repeated sterilisation using proper autoclaving techniques. At the end of surgery, unused portions of the apparatus should be cleaned well with soapy solution and brushed (especially the pieces which has holes and threaded rods). Equipment used on patients should not be reused since their integrity cannot be guaranteed.

During use, the apparatus should be checked periodically for the surface discontinuities of the rings and arches in particular, cracks in or bending of the wires should also be checked. The pieces should be replaced if they are damaged in any way.

## INDICATIONS

The device has been approved for the following indications:

- 1) Fracture fixation (Open & Closed)
- 2) Pseudoarthroses of long bones (Both congenital and acquired)
- 3) Limb lengthening by epiphyseal or metaphyseal distraction.
- 4) Correction of bony or soft tissue deformities.
- 5) Correction of bony or soft tissue defects.

The new external Ring Fixator developed using essentially a bloodless surgery technique, allows for the treatment of patients with complex diseases and bony defects that otherwise would have been unsuccessfully treated with traditional methods.

## CONTRADICTIONS

1. Patients in whom cooperation or mental competence is lacking, thereby reducing patient compliance.

## WARNING & PRECAUTIONS

### PREOPERATIVE

1. Proper understanding of the device and technique are essential. Physicians are strongly encouraged to obtain instructions from experienced clinicians or to observe surgical application of the apparatus prior to initial use of the Ring Fixator.
2. Patient selection should be in accordance with the listed indications and contraindications for use of the Ring Fixator.
3. Preliminary frame assembly is recommended to reduce operative time and to assure an adequate supply of components before surgery.
4. Correction of varus, valgus, procuratum, and recurvatum movement of limb segments during distraction should be planned for preoperatively by selecting an appropriate prophylactic ring tilt and strategically positioning wires with stoppers, fulcrums and hinges.
5. All of the device components should be sterilized before use.

### INTRAOPERATIVE

1. Wire placement requires strict anatomical consideration avoiding damage to nerves and vessels.
2. The proper wire diameter should be used to ensure sufficient wire strength and to maintain appropriate axial stiffness of the apparatus. The 1.8mm wires are usually recommended for the tibia and femur in normal adults, while the 1.5mm wire usually recommended for the upper limb and pediatric lower limb applications.
3. The wire should be gently pushed through soft tissue, not drilled, to reduce the possibility of nerve or vessel injury.
4. Wire drilling of the bone should be done slowly to avoid heat necrosis of surrounding tissue and bone.
5. Caution should be used in handling the sharp tips of the wires.

The tip of the wire should be held with a surgical sponge or soft cloth when clipped for removal. It is recommended that eye protection devices be worn by operating room personnel.

6. The diameter of the rings or assembled half rings are recommended to be used about 3cm larger than the maximum diameter of the operated limb segment. Ring sizes smaller or larger should not be used.
7. The wires should not be bent, scratched or marred during frame assembly. Bending can be avoided by using various types of washers to build the ring to the wire.
8. Appropriate tension should be applied to the regular wires: atleast 100kg. And no greater than 130kg.
9. Wires with stoppers or " olives " are not always placed under tension, depending upon the application.
10. The limb segments should be twisted carefully to verify completion of the corticotomy: The tibia should only be externally rotated to prevent undue traction on the peroneal nerve.
11. Proper fixation of components is essential. All wires and miscellaneous parts ( bolts, rods, nuts, etc.) should be securely fastened with the appropriate instrument.

### POSTOPERATIVE

1. Physiologic use of the affected limb and weight bearing when appropriate is advocated.
2. Meticulous wire-site care is crucial in reducing wire- tract infection. A suggested course is to surround the site with antiseptic soaked foam sponges. Persistent infection may necessitate wire removal.
3. The average recommended rate of bone or soft tissue distraction is 1mm/day, accomplished by 1/4mm movement every 6 hours. However, rates slower than this may be needed in situations of delayed consolidation, or faster than this in cases of premature consolidation of hinges are used.
4. Wire tension and frame integrity should be checked routinely. Some component bending or breakage may occur during use.
5. The patient should be instructed to report any adverse or unanticipated effects immediately to the physician. The patient should be instructed about apparatus distraction and adjustment.
6. Weekly to every other week post - operative follow-ups and radiographs are recommended during the distraction phase. This frequency may be reduced to monthly during the fixation phase.

### POSSIBLE ADVERSE EFFECTS

1. Damage to nerves or vessels caused during insertion of the wires or during elongation of an anatomical segment.
2. Superficial or deep wire tract infection.
3. Edema or swelling ; possible compartment syndrome.
4. Joint contracture or loss of range of motion.
5. Septic arthritis and osteomyelitis.
6. Premature consolidation during bone elongation.
7. Loosening or breakage of the wires.
8. Poor result caused by patient non compliance.
9. Bone deformity.
10. Intractable pain.
11. Fracture of regenerated bone.
12. Joint subluxation or dislocation.
13. Foreign body reaction to wires or other components.
14. Tissue necrosis occuring during wire insertion.
15. Persistent drainage after wire removal; chronic wire site osteomyelitis.
16. Skin pressure problems caused by external components.
17. Limb length discrepancy.
18. Inadvertent injury to the patient or operating room personnel caused by the wire (eg. Projectile wire from tip cutting during surgery).

# The Ring Fixator System



## Half Rings

| Part No.    | Internal Dia |
|-------------|--------------|
| D 100000080 | 80           |
| D 100000100 | 100          |
| D 100000110 | 110          |
| D 100000120 | 120          |
| D 100000130 | 130          |
| D 100000140 | 140          |
| D 100000150 | 150          |
| D 100000160 | 160          |
| D 100000180 | 180          |
| D 100000200 | 200          |
| D 100000220 | 220          |
| D 100000240 | 240          |



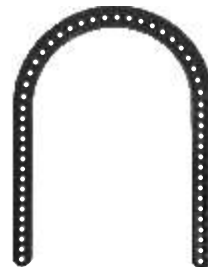
## Aluminium 2/3 Rings

| Part No.    | Internal Dia |
|-------------|--------------|
| D 230000140 | 140          |
| D 230000160 | 160          |
| D 230000180 | 180          |
| D 230000200 | 200          |
| D 230000220 | 220          |



## Aluminium Half Ring

| Part No.    | Internal Dia |
|-------------|--------------|
| D 229000140 | 140          |
| D 229000160 | 160          |
| D 229000180 | 180          |
| D 229000200 | 200          |
| D 229000220 | 220          |



## Aluminium Foot Ring

| Part No.    | Internal Dia |
|-------------|--------------|
| D 231000120 | 120          |
| D 231000140 | 140          |
| D 231000160 | 160          |
| D 231000180 | 180          |
| D 231000200 | 200          |
| D 231000220 | 220          |



## Composite Half Rings with Carbon Reinforcement

| Part No.    | Internal Dia |
|-------------|--------------|
| D 103000080 | 80           |
| D 103000100 | 100          |
| D 103000110 | 110          |
| D 103000120 | 120          |
| D 103000130 | 130          |
| D 103000140 | 140          |
| D 103000150 | 150          |
| D 103000160 | 160          |
| D 103000180 | 180          |
| D 103000200 | 200          |
| D 103000220 | 220          |
| D 103000240 | 240          |



## Aluminium Conventional Foot Rings Short Arm

| Part No.    | Internal Dia |
|-------------|--------------|
| D 234000120 | 120          |
| D 234000140 | 140          |
| D 234000160 | 160          |
| D 234000180 | 180          |



## # Rings with Curved Extremities

| Part No.    | Internal Dia |
|-------------|--------------|
| D 105000120 | 120          |
| D 105000130 | 130          |
| D 105000150 | 150          |
| D 105000160 | 160          |



## Aluminium Conventional Foot Rings Long Arm

| Part No.    | Internal Dia |
|-------------|--------------|
| D 235000120 | 120          |
| D 235000140 | 140          |
| D 235000160 | 160          |
| D 235000180 | 180          |

# Manufactured against special order

# The Ring Fixator System



## Composite Foot Rings with Carbon reinforcement Short Arm

| Part No.    | Internal Dia. |
|-------------|---------------|
| D 104000080 | 80            |
| D 104000100 | 100           |
| D 104000140 | 140           |
| D 104000160 | 160           |
| D 104000180 | 180           |



## Composite Foot Rings with Carbon reinforcement Long Arm

| Part No.    | Internal Dia. |
|-------------|---------------|
| D 107000080 | 80            |
| D 107000100 | 100           |
| D 107000140 | 140           |
| D 107000160 | 160           |
| D 107000180 | 180           |



## # 5/8 Rings

| Part No.    | Internal Dia. |
|-------------|---------------|
| D 102000100 | 100 #         |
| D 102000110 | 110 #         |
| D 102000120 | 120 #         |
| D 102000130 | 130           |
| D 102000140 | 140 #         |
| D 102000150 | 150           |
| D 102000160 | 160           |
| D 102000180 | 180 #         |
| D 102000200 | 200 #         |
| D 102000220 | 220 #         |
| D 102000240 | 240 #         |



## Composite 5/8 Rings

| Part No.    | Internal Dia. |
|-------------|---------------|
| D 106000100 | 100 #         |
| D 106000120 | 120 #         |
| D 106000130 | 130           |
| D 106000180 | 180 #         |
| D 106000200 | 200 #         |



## Arches with Holes

| Part No.    | Internal Radius |
|-------------|-----------------|
| D 110000090 | 90              |
| D 110000110 | 110             |
| D 110000120 | 120 #           |
| D 110000140 | 140             |



## Italian Femoral Arches

| Part No.    | Description |
|-------------|-------------|
| D 108000190 | 90° Small   |
| D 108001120 | 120° Small  |
| D 108000390 | 90° Large   |
| D 108003120 | 120° Large  |



## Italian Femoral Arches with hole

| Part No.    | Description |
|-------------|-------------|
| D 228000190 | 90° Small   |
| D 228001120 | 120° Small  |
| D 228000390 | 90° Large   |
| D 228003120 | 120° Large  |



## Threaded Rods

| Part No.    | Length |
|-------------|--------|
| D 111000040 | 40     |
| D 111000060 | 60     |
| D 111000080 | 80     |
| D 111000100 | 100    |
| D 111000120 | 120    |
| D 111000150 | 150    |
| D 111000200 | 200    |
| D 111000250 | 250    |
| D 111000300 | 300    |
| D 111000350 | 350    |
| D 111000400 | 400    |



## Threaded Rods - Slotted

| Part No.    | Length |
|-------------|--------|
| D 112000040 | 40     |
| D 112000060 | 60     |
| D 112000080 | 80     |
| D 112000100 | 100    |



## Threaded Rods - Partial

| Part No.    | Length |
|-------------|--------|
| D 113000060 | 60 #   |
| D 113000130 | 130    |
| D 113000170 | 170    |
| D 113000210 | 210    |

# The Ring Fixator System



## Telescopic Rods

| Part No.    | Length |
|-------------|--------|
| D 114000060 | 60#    |
| D 114000100 | 100    |
| D 114000150 | 150    |
| D 114000200 | 200    |
| D 114000250 | 250    |
| D 114000300 | 300#   |
| D 114000350 | 350#   |
| D 114000400 | 400#   |



## Graduated Telescopic Rods

| Part No.    | Length |
|-------------|--------|
| D 115000060 | 60     |
| D 115000100 | 100    |
| D 115000150 | 150    |
| D 115000200 | 200    |
| D 115000250 | 250    |



## Hinges - Female

| Part No.    | Description |
|-------------|-------------|
| D 123000001 | Standard    |
| D 123000002 | Low Profile |



## Hinges - Male

| Part No.    | Description |
|-------------|-------------|
| D 124000001 | Standard    |
| D 124000002 | Low Profile |



## Hinges - 90

| Part No.    | Description |
|-------------|-------------|
| D 125000190 | Standard    |
| D 125000290 | Low Profile |



## Post - Female

| Part No.    | Holes |
|-------------|-------|
| D 121000002 | 2     |
| D 121000003 | 3     |
| D 121000004 | 4     |



## Post - Male

| Part No.    | Holes |
|-------------|-------|
| D 122000002 | 2     |
| D 122000003 | 3     |
| D 122000004 | 4     |



## Universal Joint

| Part No. | D 177001000 |
|----------|-------------|
|          |             |



## Rotational and Translational Device

| Part No. | D 179001000 |
|----------|-------------|
|          |             |



## Short Connection Plates

| Part No.    | Length | Holes |
|-------------|--------|-------|
| D 131000235 | 35     | 2     |
| D 131000345 | 45     | 3     |
| D 131000455 | 55     | 4     |
| D 131000565 | 65     | 5     |
| D 131000675 | 75     | 6     |
| D 131000785 | 85     | 7     |
| D 131000895 | 95     | 8     |
| D 131009105 | 105    | 9     |
| D 131010115 | 115    | 10    |



## Long Connection Plates

| Part No.    | Length | Holes |
|-------------|--------|-------|
| D 133008155 | 155    | 8     |
| D 133012235 | 235    | 12    |
| D 133017335 | 335    | 17    |

# The Ring Fixator System



## Connected Plates with Threaded Ends

| Part No.    | Length | Holes |
|-------------|--------|-------|
| D 135005135 | 135    | 5     |
| D 135007175 | 175    | 7     |
| D 135009215 | 215    | 9     |
| D 135011255 | 255    | 11    |



## Twisted Plates

| Part No.    | Holes |
|-------------|-------|
| D 140000245 | 2#    |
| D 140000365 | 3     |
| D 140000485 | 4     |



## Curved Plates

| Part No.    | Holes |
|-------------|-------|
| D 141000003 | 3     |



## Bushing

|          |             |
|----------|-------------|
| Part No. | D 142000000 |
|----------|-------------|



## Threaded Sockets

| Part No.    | Holes |
|-------------|-------|
| D 148000020 | 20    |
| D 148000030 | 30    |
| D 148000040 | 40    |
| D 148000060 | 60    |



## Connection Bolts

| Part No.    | Dia |
|-------------|-----|
| D 149000010 | 10  |
| D 149000016 | 16  |
| D 149000020 | 20  |
| D 149000030 | 30  |



## Nut

| Part No.    | Description      |
|-------------|------------------|
| D 150000006 | Nut 6mm          |
| D 150000013 | Nut 13mm         |
| D 151000000 | Thin Nut         |
| D 152000000 | Nylon Insert Nut |
| D 153000000 | Square Nut       |



## Flat Sided Washers

| Part No.    | Thickness |
|-------------|-----------|
| D 156000020 | 2.0       |
| D 156000040 | 4.0       |



## Slotted washers

| Part No.    | Thickness |
|-------------|-----------|
| D 157000040 | 4.0       |



## Spacing Washers

| Part No.    | Thickness |
|-------------|-----------|
| D 154000015 | 1.5       |
| D 154000020 | 2.0       |



## Split Locking Washers

| Part No.    | Thickness |
|-------------|-----------|
| D 155000020 | 2.0       |



## Conical Washer Couple

|          |             |
|----------|-------------|
| Part No. | D 158001000 |
|----------|-------------|



## Star Washers

|          |             |
|----------|-------------|
| Part No. | D 159001000 |
|----------|-------------|



## Wire Fixation Bolts

| Part No.    | Description                   |
|-------------|-------------------------------|
| D 163000000 | Cannulated                    |
| D 164000000 | Cannulated with Threaded Head |
| D 162000000 | Slotted                       |



## Wire Fixation Buckle

|          |             |
|----------|-------------|
| Part No. | D 169000000 |
|----------|-------------|

# The Ring Fixator System



## Single Pin Fixation Bolt

Part No. D 167000000



## Multiple Pin Fixation Clamp

Part No. D 168001000



## Oblique Support Connection

Part No. D 180001000



## Blocks For Half Pins

| Part No.    | Holes |
|-------------|-------|
| D 176000001 | 1     |
| D 176000002 | 2     |
| D 176000003 | 3     |
| D 176000004 | 4     |
| D 176000005 | 5     |



## Blocks For Half Pins to be used with Sleeves

| Part No.    | Holes |
|-------------|-------|
| D 200000001 | 1     |
| D 200000002 | 2     |
| D 200000003 | 3     |
| D 200000004 | 4     |
| D 200000005 | 5     |

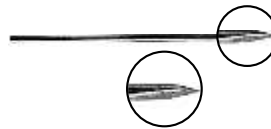


## Sleeves

| Part No.    | Length |
|-------------|--------|
| D 201000003 | 3mm#   |
| D 201000004 | 4mm    |
| D 201000005 | 5mm    |
| D 201000006 | 6mm    |

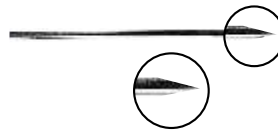
## Wires : Bayonet Point - Cortical

| Part No.    | Dia |
|-------------|-----|
| D 187015300 | 1.5 |
| D 187018370 | 1.8 |



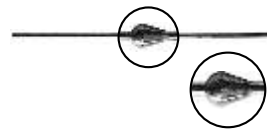
## Wires : Trocar Point - Cancellous

| Part No.    | Dia |
|-------------|-----|
| D 188015300 | 1.5 |
| D 188018370 | 1.8 |



## With Stopper ( Bayonet Point )

| Part No.    | Dia | Holes |
|-------------|-----|-------|
| D 189015300 | 1.5 | 300   |
| D 189018400 | 1.8 | 400   |



## Instruments for Block for Half Pins

### Drill Guide & Trocar

| Part No.    |                    |
|-------------|--------------------|
| D 507001000 | Drill Guide 4.8 mm |
| D 508001000 | Screw Guide 6 mm   |
| D 509001000 | Trocar 6 mm        |



### Set Screw

Part No. D 181000000



### Straight Screw Driver for Set Screws

| Part No.    |                 |
|-------------|-----------------|
| D 510001000 | 3mm Across Flat |



### 90° Screw Driver for Set Screws

| Part No.    |                 |
|-------------|-----------------|
| D 511001000 | 3mm Across Flat |

# The Ring Fixator System

## Basic Instrument set for Ring Fixator System



### Box Wrench for Nut

Part No. D 505001000



### Box Wrench for Bolt

Part No. D 500001000



### Combination Wrench

| Part No.    | Size |
|-------------|------|
| D 502101000 | 10mm |
| D 502131000 | 13mm |
| D 502191000 | 19mm |



### Wire Tensioner - Mechanical

Part No. D 502001000



### Wire Tensioner - Direct Measuring

Part No. D 503001000



### Corticotome

| Part No.    | Size |
|-------------|------|
| D 504001003 | 3mm  |
| D 504001005 | 5mm  |
| D 504001007 | 7mm  |
| D 504001009 | 9mm  |



### Half Pin Introducer

Part No. C 507001000



## Containers for Ring Fixator System

### Container for Rings 80 to 130 mm

Part No. H 832001000

### Container for Rings 140 to 180 mm

Part No. H 833001000

### Container for Rings 200 to 240 mm

Part No. H 825001000

### Container for Special Rings & Arches

Part No. H 826001000

### Container for Bolts, Nuts & Washers

Part No. H 827001000

### Container for Plates

Part No. H 828001000

### Container for Wires & Instruments

Part No. H 829001000

### Container for Rods, Posts, Support & Hinges

Part No. H 830001000

### Container for Telescopic Rod

Part No. H 831001000

### Container for Adult Tibial Basic Set

Part No. H 858001000

### Container for Adult femoral Basic set

Part No. H 859001000

### Container for Blocks for half pin components set

Part No. H 841001000

### Container for Blocks for half pin components set

Part No. H 851001000

### Container for Basic Instruments set

Part No. H 854001000



# Pediatric Ring Fixator System



## Composite Half Ring

| Part No.    | Internal Dia. |
|-------------|---------------|
| E 112000080 | 80mm          |
| E 112000090 | 90mm          |
| E 112000100 | 100mm         |
| E 112000110 | 110mm         |
| E 112000120 | 120mm         |

## SS Half Ring

| Part No.    | Internal Dia. |
|-------------|---------------|
| E 110000060 | 60mm          |
| E 110000070 | 70mm          |
| E 110000080 | 80mm          |
| E 110000090 | 90mm          |
| E 110000100 | 100mm         |
| E 110000110 | 110mm         |
| E 110000120 | 120mm         |

## Composite Foot Ring

| Part No.    | Internal Dia. |
|-------------|---------------|
| E 114000080 | 80mm          |
| E 114000100 | 100mm         |

## Composite 3/4 Ring

| Part No.    | Internal Dia. |
|-------------|---------------|
| E 115000090 | 90mm          |
| E 115000100 | 100mm         |
| E 115000110 | 110mm         |
| E 115000120 | 120mm         |

## Telescopic Rod

| Part No.    | Length |
|-------------|--------|
| E 129000040 | 40 mm  |
| E 129000060 | 60 mm  |
| E 129000080 | 80 mm  |



## Oblique Support

|          |             |
|----------|-------------|
| Part No. | E 161001000 |
|----------|-------------|



## Universal Joint

|          |             |
|----------|-------------|
| Part No. | E 122001000 |
|----------|-------------|



## Threaded Rods

| Part No.    | Length<br>mm |
|-------------|--------------|
| E 127000040 | 40           |
| E 127000060 | 60           |
| E 127000080 | 80           |
| E 127000100 | 100          |
| E 127000120 | 120          |
| E 127000150 | 150          |
| E 127000200 | 200          |



## Threaded Rod - Slotted

| Part No.    | Length<br>mm |
|-------------|--------------|
| E 128000040 | 40           |
| E 128000060 | 60           |



## Wire fixation buckle

|          |             |
|----------|-------------|
| Part No. | E 177001000 |
|----------|-------------|



## Bushings

|          |             |
|----------|-------------|
| Part No. | E 121000000 |
|----------|-------------|

# Pediatric Ring Fixator System



## Post Male

| Part No.    | Holes |
|-------------|-------|
| E 135000002 | 2     |
| E 135000003 | 3     |
| E 135000004 | 4     |

## Post Female

| Part No.    | Holes |
|-------------|-------|
| E 136000002 | 2     |
| E 136000003 | 3     |
| E 136000004 | 4     |

## Hinges Male

|          |             |
|----------|-------------|
| Part No. | E 142000001 |
|----------|-------------|

## Hinges Female

|          |             |
|----------|-------------|
| Part No. | E 143000001 |
|----------|-------------|

## Twisted Plate- 90°

|          |             |
|----------|-------------|
| Part No. | E 120000090 |
|----------|-------------|

## Wire fixation bolt

| Part No.    | Type       |
|-------------|------------|
| E 146000001 | Cannulated |
| E 146000002 | Slotted    |

## Washers

| Part No.    |         |
|-------------|---------|
| E 152000010 | 1 mm    |
| E 152000015 | 1.5 mm  |
| E 153000000 | Slotted |

## Connection Bolts & Nuts M5

| Part No.    | mm             |
|-------------|----------------|
| E 150000010 | 10             |
| E 150000016 | 16             |
| E 150000020 | 20#            |
| E 151000000 | Nut M5         |
| E 151000001 | Nylon Nut M5   |
| E 154000000 | Triangular Nut |



## Plate Adaptor

| Part No.    | Length |
|-------------|--------|
| E 155000020 | 20mm   |
| E 155000030 | 30mm   |



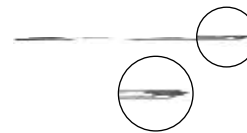
## Block for Half Pins

| Part No.    | Hole |
|-------------|------|
| E 176000001 | 1    |
| E 176000002 | 2    |



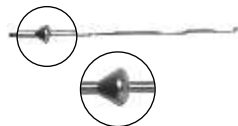
## Conical Washer Couple

|          |             |
|----------|-------------|
| Part No. | E 178001000 |
|----------|-------------|



## Wires

| Part No.    | Dia | Length |
|-------------|-----|--------|
| E 159010250 | 1.0 | 250    |
| E 159012300 | 1.2 | 300    |
| E 159015300 | 1.5 | 300    |



## Wires: with Stoppers

| Part No.    | Dia | Length |
|-------------|-----|--------|
| E 160001250 | 1.0 | 250    |
| E 160012250 | 1.2 | 250    |
| D 189015300 | 1.5 | 300    |

## INSTRUMENTS

### Box wrench 8mm

|          |             |
|----------|-------------|
| Part No. | E 500000008 |
|----------|-------------|



### Combination wrench 8 mm

|          |             |
|----------|-------------|
| Part No. | E 501000008 |
|----------|-------------|



### Wire Tensioner Direct Measuring

|          |             |
|----------|-------------|
| Part No. | E 505001000 |
|----------|-------------|



### Containers for Pediatric Ring Fixation System

| Part No.   | Container              |
|------------|------------------------|
| H842001000 | Pediatric ring & plate |
| H843001000 | Pediatric Components   |

