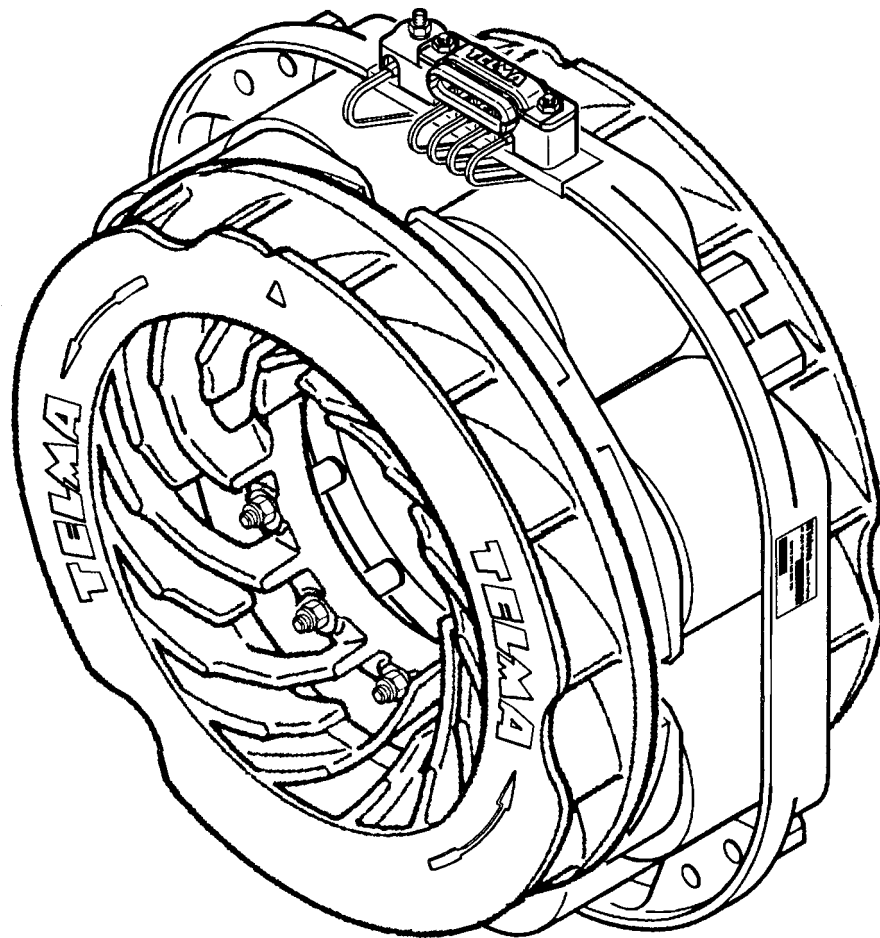


Telma

SPARE PARTS CATALOGUE OF THE FOCAL RETARDERS FN, FP and FV SERIES



OC443001/c
Edition 09/2002

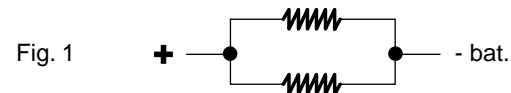
TABLE OF CONTENTS

| | |
|---|-------|
| Technical specifications of the FOCAL retarders – FV series | 2 |
| – FN and FP series | 3 |
| Identification of the FOCAL retarders by their dimensions | 4 |
| Exploded view and list of spare parts | |
| Types: FV60–90 (F90) FV61–30 (F130) | 5 |
| Types: FV61–00 (F101) FV61–31 FV61–40 (F141) | 6-7 |
| Types: FV71–50 (F151) FV71–70 (F170) FV71–90 (F191) | 8-9 |
| Types: FN72–00 (F2000) FN72–20 (F2200) FN72–40 (F2400) | 10-11 |
| Types: (F250) FV82–70 (F271) FV82–60 (F272) FV83–00 (F301) | 12-13 |
| Types: FN82–70 (F2700) FN83–00 (F3000) FN83–30 (F3300) | 14-15 |
| Types: FP82–00 (F200) FP82–70 | 16-17 |
| Spare coil assembly | 18-19 |
| Internal wiring assembly | 20-25 |
| Chart for cutting the single wires on the connecting block and the wires between the coils | 26 |
| Chart for cutting the double wires on the connecting block | 27 |
| Chart for cutting the earth return wires (version of connecting block with integrated earth return terminal) | 28 |
| Chart for cutting the earth return wires (version with earth return terminal on the stator housing) | 29 |
| Connecting block assembly | 30 |
| Earth terminal assembly | 31 |
| Sealing kits | 32 |
| Rotors securing - Layout and tightening torques | 33 |
| Crimping tool and wiring repair kit | 34 |
| Replacement of a coil | 35-36 |
| FOCAL retarders with thermal protection (24 V) | 37 |
| – earth return terminal and internal wiring diagram | 38 |
| – electrical spare parts | 39 |
| – installation wiring diagrams | 40 |

Technical specifications of the FOCAL retarders – FV series

| RETARDER MODEL | | FV60–90 (F90) | FV61–00 (F100) | FV61–30 (F130) | FV61–31 | FV61–40 (F141) | FV71–50 (F151) | FV71–70 (F170) | FV71–90 (F191) | (F250) | FV82–60 (F272) | FV82–70 (F271) | FV83–00 (F301) |
|--|--------------------|------------------|-------------------|-------------------|---------|-------------------|-------------------|-------------------|-------------------|--------|-------------------|-------------------|-------------------|
| RETARDER CODE | | FU | FU | FJ | FJ | FJ | FD | FD | FD | FF | DR | FF | FF |
| For gearbox mounting | | 63 | / | 62 | 80 | 74 | 39 | 62 | 74 | 66 | 20 | 74 | 70 |
| For axle mounting | | 63 | 83 | 62 | 81 | 79 | 83 | 61 | 79 | / | / | / | 75 |
| MAXIMUM BRAKING TORQUE | Nm | 900 | 1000 | 1300 | 1300 | 1400 | 1500 | 1700 | 1900 | 2500 | 2650 | 2700 | 3000 |
| | lb-ft | 664 | 737 | 958 | 958 | 1032 | 1105 | 1253 | 1400 | 1843 | 1956 | 1990 | 2211 |
| APPLICATION RANGE G.C.W. (1) | t | 6/10 | 6/10 | 9/15 | 9/15 | 9/15 | 13/17 | 15/17 | 15/19 | 26/44 | 32/44 | 32/44 | 40/44 |
| TOTAL MASS | kg | 116 | 116 | 129 | 130 | 130 | 149 | 168 | 170 | 233 | 204 | 245 | 247 |
| | lb | 256 | 256 | 284 | 286 | 286 | 328 | 370 | 374 | 514 | 447 | 540 | 545 |
| Stator mass | kg | 67 | 67 | 80 | 81 | 81 | 85 | 104 | 106 | 155 | 126 | 167 | 169 |
| | lb | 148 | 148 | 176 | 178 | 178 | 187 | 229 | 233 | 342 | 278 | 368 | 373 |
| Rotors mass (without intermediate flange) | kg | 49 | 49 | 49 | 49 | 49 | 64 | 64 | 64 | 78 | 78 | 78 | 78 |
| | lb | 108 | 108 | 108 | 108 | 108 | 141 | 141 | 141 | 172 | 172 | 172 | 172 |
| ROTORS INERTIA | kgm ² | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 2 | 2 | 2 | 3.1 | 3.1 | 3.1 | 3.1 |
| | lb-ft ² | 29.2 | 29.2 | 29.2 | 29.2 | 29.2 | 47.5 | 47.5 | 47.5 | 74 | 74 | 74 | 74 |
| AIR-GAP | (0 -0.15) mm | 1.3 | 1.3 | 1.3 | 1.5 | 1.3 | 1.4 | 1.4 | 1.4 | 1.7 | 1.7 | 1.7 | 1.7 |
| | (0 -0.006) inch | 0.051 | 0.051 | 0.051 | 0.059 | 0.051 | 0.055 | 0.055 | 0.055 | 0.066 | 0.066 | 0.066 | 0.066 |
| RESISTANCE PER CIRCUIT ± 5 % at 20°C (68°F) | 12 Volts | Ω | 0.33 | 0.33 | 0.23 | / | 0.23 | 0.25 | 0.25 | 0.21 | 0.2 | / | 0.19 |
| | 24 Volts | Ω | 1.3 | 1.3 | 0.91 | 0.91 | 0.91 | 1.02 | 1 | 0.86 | 0.79 | 0.6 | 0.78 |
| RESISTANCE PER COIL ± 5 % at 20°C (68°F) | Ω | 0.65 | 0.65 | 0.46 | 0.46 | 0.46 | 0.51 | 0.50 | 0.43 | 0.39 | 1.21 | 0.39 | 1.31 |
| AMPERAGE PER CIRCUIT ± 5 % at 20°C (68°F) | 12 Volts | A | 37 | 37 | 52.5 | / | 52.5 | 47.1 | 48 | 55.8 | 60.9 | / | 61.5 |
| | 24 Volts | A | 18.5 | 18.5 | 26.2 | 26.2 | 26.2 | 23.5 | 24 | 27.9 | 30.6 | 38.5 | 30.8 |
| INSULATION RESISTANCE | MΩ | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 |
| CIRCUIT DIAGRAM (see figures 1 and 2) | 12V | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | / | 1 | / |
| | 24V | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 |

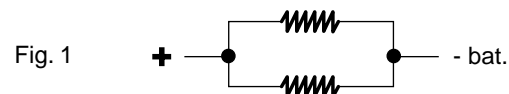
(1) For all specific application, please consult our Technical Department.



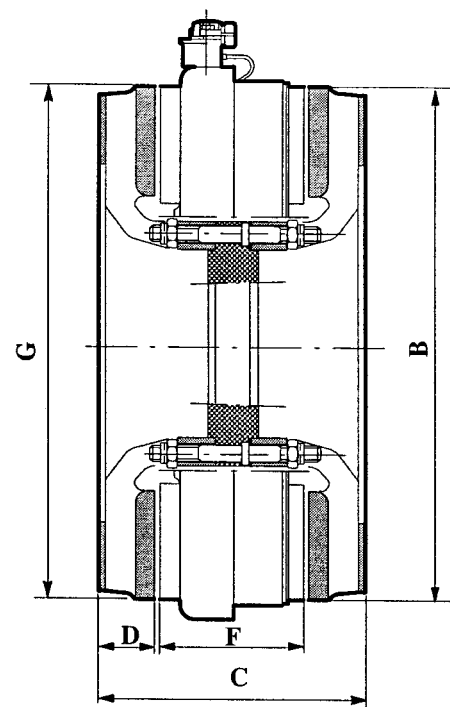
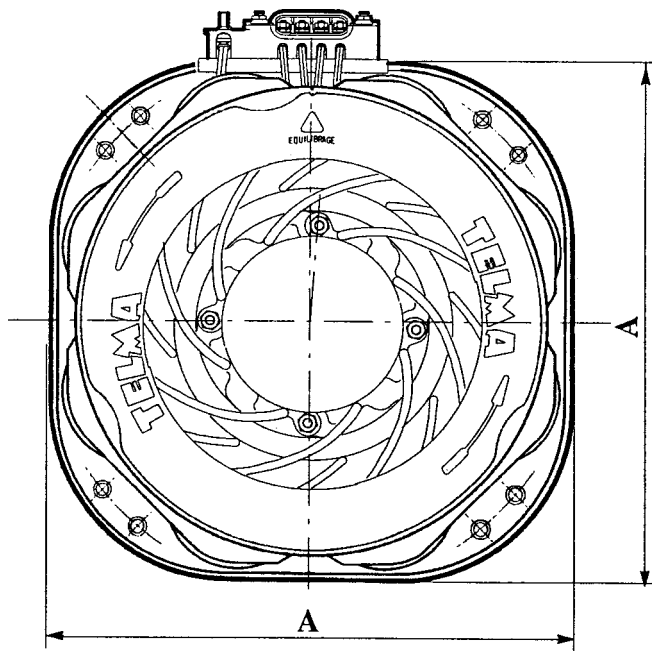
Technical specifications of the FOCAL retarders – FN and FP series

| RETARDER MODEL | | FN72-00 (F2000) | FN72-20 (F2200) | FN72-40 (F2400) | FN82-70 (F2700) | FN83-00 (F3000) | FN83-30 (F3300) | FP82-00 (F200) | FP82-70 |
|--|---------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|---------|
| RETARDER CODE | | DH | DJ | DK | DL | DN | DP | FS | DS |
| For gearbox mounting | | 20 | 20 | 20 | 20 | 20 | 20 | 62 | 20 |
| For axle mounting | | 31 | 31 | 31 | / | 31 | / | / | / |
| MAXIMUM BRAKING TORQUE | Nm | 2000 | 2200 | 2400 | 2700 | 3000 | 3300 | 2000 | 2600 |
| | lb-ft | 1474 | 1621 | 1769 | 1990 | 2211 | 2432 | 1474 | 1917 |
| APPLICATION RANGE | t | 16/22 | 19/26 | 19/26 | 32/44 | 40/44 | 40/50 | 19/26 | 18/26 |
| TOTAL MASS | kg | 174 | 174 | 185 | 249 | 257 | 255 | 209 | 200 |
| | lb | 383 | 383 | 407 | 549 | 567 | 562 | 461 | 441 |
| Stator mass | kg | 107 | 107 | 118 | 167 | 175 | 173 | 137 | 128 |
| | lb | 236 | 236 | 260 | 368 | 386 | 381 | 302 | 282 |
| Rotors mass (without intermediate flange) | kg | 67 | 67 | 67 | 82 | 82 | 82 | 72 | 72 |
| | lb | 147 | 147 | 147 | 181 | 181 | 181 | 159 | 159 |
| ROTORS INERTIA | kgm ² | 2.33 | 2.33 | 2.33 | 3.33 | 3.33 | 3.33 | 2.7 | 2.7 |
| | lb-ft ² | 55.3 | 55.3 | 55.3 | 79 | 79 | 79 | 64 | 64 |
| AIR-GAP | <i>(0 -0.15)</i> mm | 1.4 | 1.4 | 1.4 | 1.7 | 1.7 | 1.7 | 1.5 | 1.5 |
| | <i>(0 -0.006)</i> inch | 0.055 | 0.055 | 0.055 | 0.066 | 0.066 | 0.066 | 0.059 | 0.059 |
| RESISTANCE PER CIRCUIT ± 5 % at 20°C (68°F) | 12 Volts | Ω | 0.21 | 0.18 | 0.17 | 0.19 | / | / | / |
| | 24 Volts | Ω | 0.83 | 0.7 | 0.69 | 0.78 | 0.72 | 0.56 | 0.57 |
| RESISTANCE PER COIL ± 5 % at 20°C (68°F) | Ω | 0.42 | 0.35 | 0.34 | 0.39 | 1.43 | 1.12 | 0.4 | 0.28 |
| AMPERAGE PER CIRCUIT ± 5 % at 20°C (68°F) | 12 Volts | A | 57.8 | 68.6 | 69.8 | 61.5 | / | / | / |
| | 24 Volts | A | 28.9 | 34.3 | 34.9 | 30.8 | 33.5 | 43 | 42.2 |
| INSULATION RESISTANCE | MΩ | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 |
| CIRCUIT DIAGRAM (see figures 1 and 2) | 12V | 1 | 1 | 1 | 1 | / | / | / | / |
| | 24V | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 |

(1) For all specific application, please consult our Technical Department.



Identification of the FOCAL retarders by their dimensions (mm)

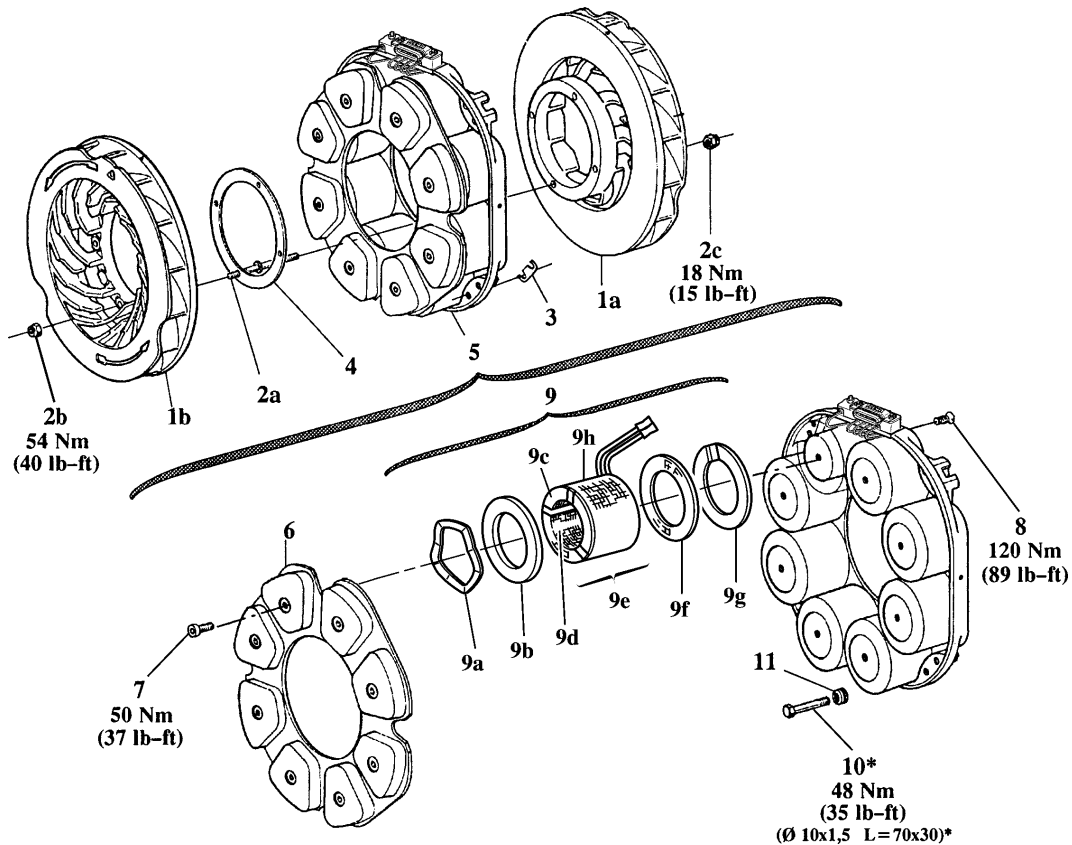


| Dimension | RETARDER | | | | | | | | | | | | | | | | |
|-----------|------------------|-------------------|-------------------|------------------------------|-------------------|-------------------|-------------------|--------|-------------------|-------------------|-------------------|--|--------------------|--------------------|--|-------------------|---------|
| | FV60-90 (F90) | FV61-00 (F101) | FV61-30 (F130) | FV61-31 FV61-40 (F141) | FV71-50 (F151) | FV71-70 (F170) | FV71-90 (F191) | (F250) | FV82-60 (F272) | FV82-70 (F271) | FV83-00 (F301) | FN72-00 (F2000) FN72-20 (F2200) | FN72-40 (F2400) | FN82-70 (F2700) | FN83-00 (F3000) FN83-30 (F3300) | FP82-00 (F200) | FP82-70 |
| A | 463 | 463 | 463 | 463 | 516 | 516 | 516 | 562 | 562 | 562 | 562 | 516 | 516 | 562 | 562 | 562 | 562 |
| B | Ø 430 | Ø 430 | Ø 430 | Ø 430 | Ø 475 | Ø 475 | Ø 475 | Ø 510 | Ø 510 | Ø 510 | Ø 510 | Ø 485 | Ø 485 | Ø 528 | Ø 528 | Ø 510 | Ø 510 |
| C | 216 | 216 | 216 | 216 | 239,3 | 239,3 | 239,3 | 294 | 294 | 294 | 294 | 239,3 | 241,8 | 283 | 283 | 262 | 246 |
| D | 46 | 46 | 46 | 46 | 54 | 54 | 54 | 66 | 66 | 66 | 66 | 54 | 54 | 60,5 | 60,5 | 50 | 50 |
| F | 121,4 | 121,4 | 121,4 | 121,4 | 128,5* | 128,5* | 128,5* | 158,5 | 158,5 | 158,5 | 158,5 | 128,5* | 131 | 158,5 | 158,5 | 158,5 | 142,5 |
| G | / | / | / | / | / | / | / | / | / | / | / | / | / | Ø 518 | / | / | / |

* 129.5 with truncated pole shoes

Exploded view and list of spare parts

Types: FV60-90 (F90) FV61-30 (F130)

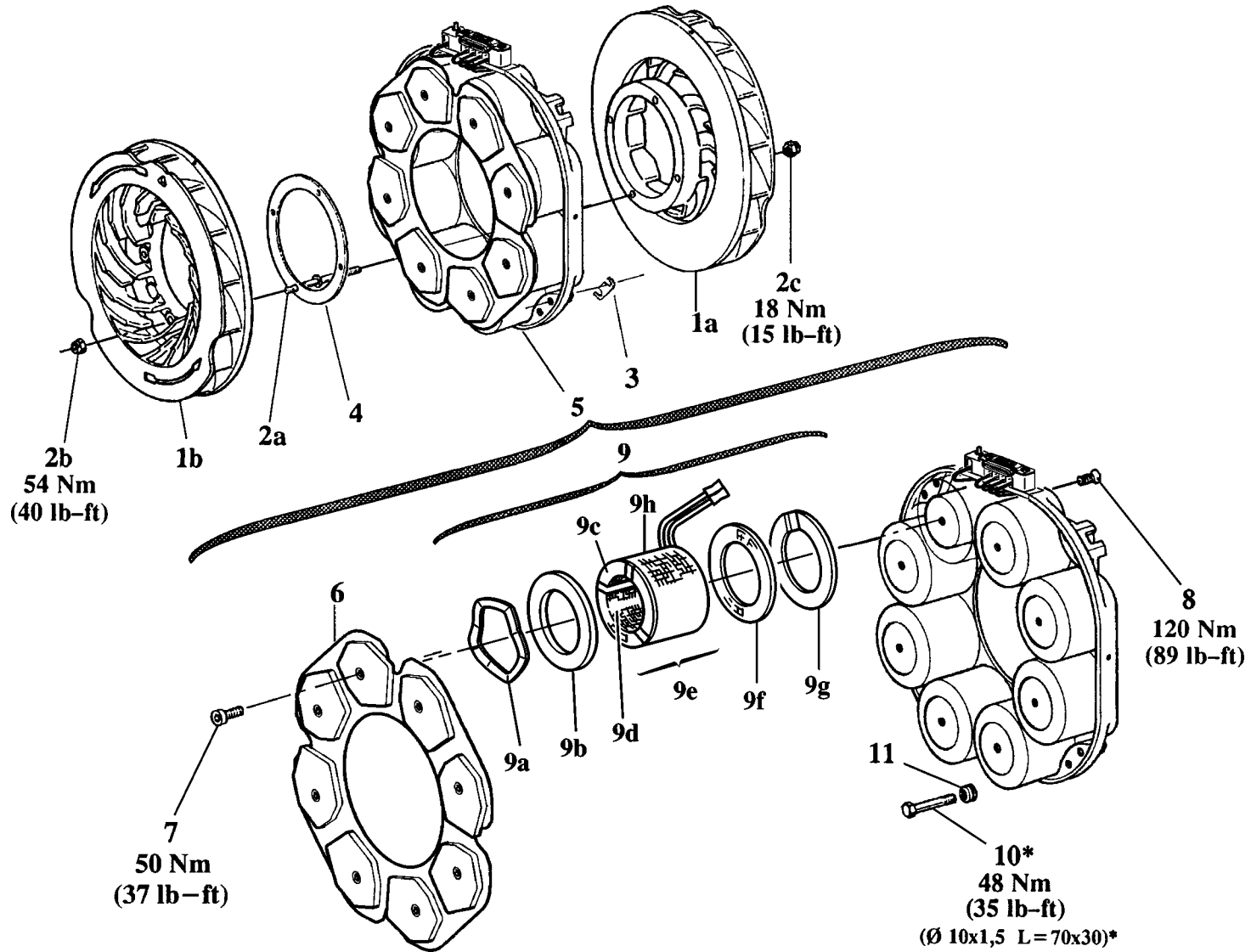


| | | FOCAL RETARDER TYPE | | FV60-90 (FOCAL 90) | FV61-30 (FOCAL 130) |
|-------|---------------------------------------|----------------------|---|-----------------------|------------------------|
| | | Retarder part number | 12V | FU631100 | FJ621100 |
| | | | 24V | FU632100 | FJ622100 |
| Item | Description | Qty | PART NUMBERS | | |
| 1 | Balanced rotors assembly, including: | 1 | VB106710 | VB106710 | |
| 1a | 1 clockwise rotor | | The rotors are only supplied as a matched balanced pair | | |
| 1b | 1 counter clockwise rotor | | | | |
| 2 | Set of rotor fasteners, including: | 1 | VB200610 | VB200610 | |
| 2a | 4 shouldered studs | | VF130530 | VF130530 | |
| 2b/2c | 8 metal locknuts | | VF120140 | VF120140 | |
| 3 | Set of stator air gap adjusting shims | 1 | VB200320 | VB200320 | |
| 4 | Set of rotor air gap adjusting shims | 1 | VB200290 | VB200290 | |
| 5 | Stator assembly 12V | 1 | VB107423 | VB106754 | |
| | Stator assembly 24V | 1 | VB107412 | VB106758 | |
| 6 | Pole shoe plate | 1 | VB101180 | VB101180 | |
| 7 | Socket cap screw M10x1.5 | 8 | VF108280 | VF108280 | |
| 8 | 90° countersunk screw M14x2 | 8 | VF109110 | VF109110 | |
| 9 | Spare coil assembly | 8 | VD310504 | VD310437 | |
| 10 | Stator securing screw | 8 | VF100360 | VF100360 | |
| 11 | Trep washer | 8 | VF201390 | VF201390 | |

* NOTE: screw length L may vary for some applications.

Exploded view and list of spare parts

Types: FV61-00 (F101) FV61-31 FV61-40 (F141)



* NOTE: screw length L may vary for some applications.

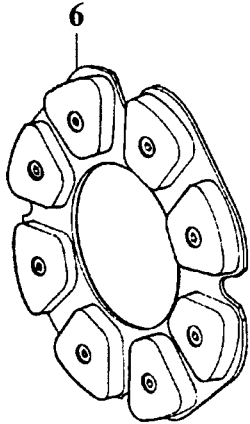
Exploded view and list of spare parts

Types: FV61-00 (F101) FV61-31 FV61-40 (F141)

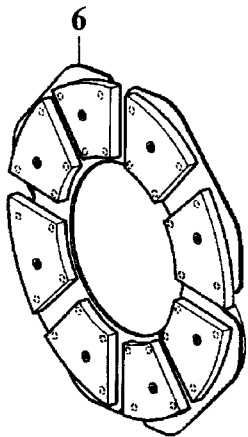
| FOCAL RETARDER TYPE | | FV61-00 (FOCAL 101) | | FV61-31 | | FV61-40 (FOCAL 141) | | |
|----------------------|---------------------------------------|-------------------------------|---|------------------|---------------|------------------------|---------------|------------------|
| | | Fitting on gearbox or on axle | | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | Gearbox mounting |
| Retarder part number | | 12V | not available | FU831100 | not available | | not available | |
| | | 24V | | FU832100 | FJ802100 | FJ812100 | FJ742100 | FJ792100 |
| Item | Description | Qty | PART NUMBERS | | | | | |
| 1 | Balanced rotors assembly, including: | 1 | / | VB106710 | VB106710 | | VB106710 | |
| 1a | 1 clockwise rotor | | The rotors are only supplied as a matched balanced pair | | | | | |
| 1b | 1 counter clockwise rotor | | | | | | | |
| 2 | Set of rotor fasteners, including: | 1 | / | VB200610 | VB200610 | | VB200610 | |
| 2a | 4 shouldered studs | | / | VF130530 | VF130530 | | VF130530 | |
| 2b/2c | 8 metal locknuts | | / | VF120140 | VF120140 | | VF120140 | |
| 3 | Set of stator air gap adjusting shims | 1 | / | VB200320 | VB200320 | | VB200320 | |
| 4 | Set of rotor air gap adjusting shims | 1 | / | VB200290 | VB200290 | | VB200290 | |
| 5 | Stator assembly 12V | 1 | / | VB107424 | not available | | not available | |
| | Stator assembly 24V | 1 | / | VB107759 | VB106727 | VB106979 | VB106727 | VB106979 |
| 6 | Pole shoe plate | 1 | / | VB106976 | VB106610 | VB106976 | VB106610 | VB106976 |
| 7 | Socket cap screw M10x1.5 | 8 | / | VF108280 | VF108280 | | VF108280 | |
| 8 | 90° countersunk screw M14x2 | 8 | / | VF109110 | VF109110 | | VF109110 | |
| 9 | Spare coil assembly | 8 | / | VD310504 | VD310437 | | VD310437 | |
| 10 | Stator securing screw | 8 | / | VF100360 | VF100360 | | VF100360 | |
| 11 | Trep washer | 8 | / | VF201390 | VF201390 | | VF201390 | |

Exploded view and list of spare parts

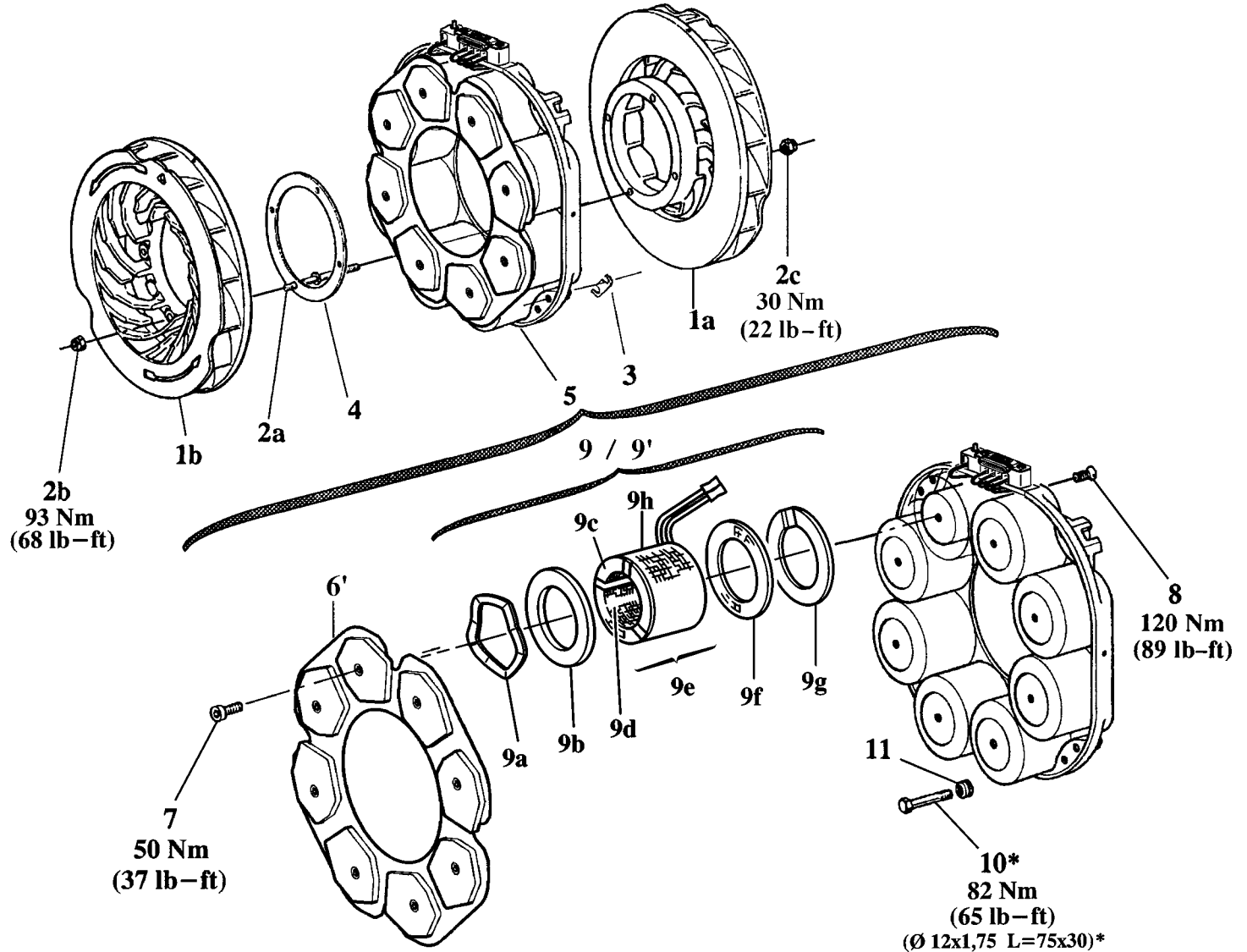
Types: FV71-50 (F151) FV71-70 (F170) FV71-90 (F191)



F170 up to serial number F181189



F191 up to serial number F180897
F151 up to serial number F182468



* NOTE: screw length L may vary for some applications.

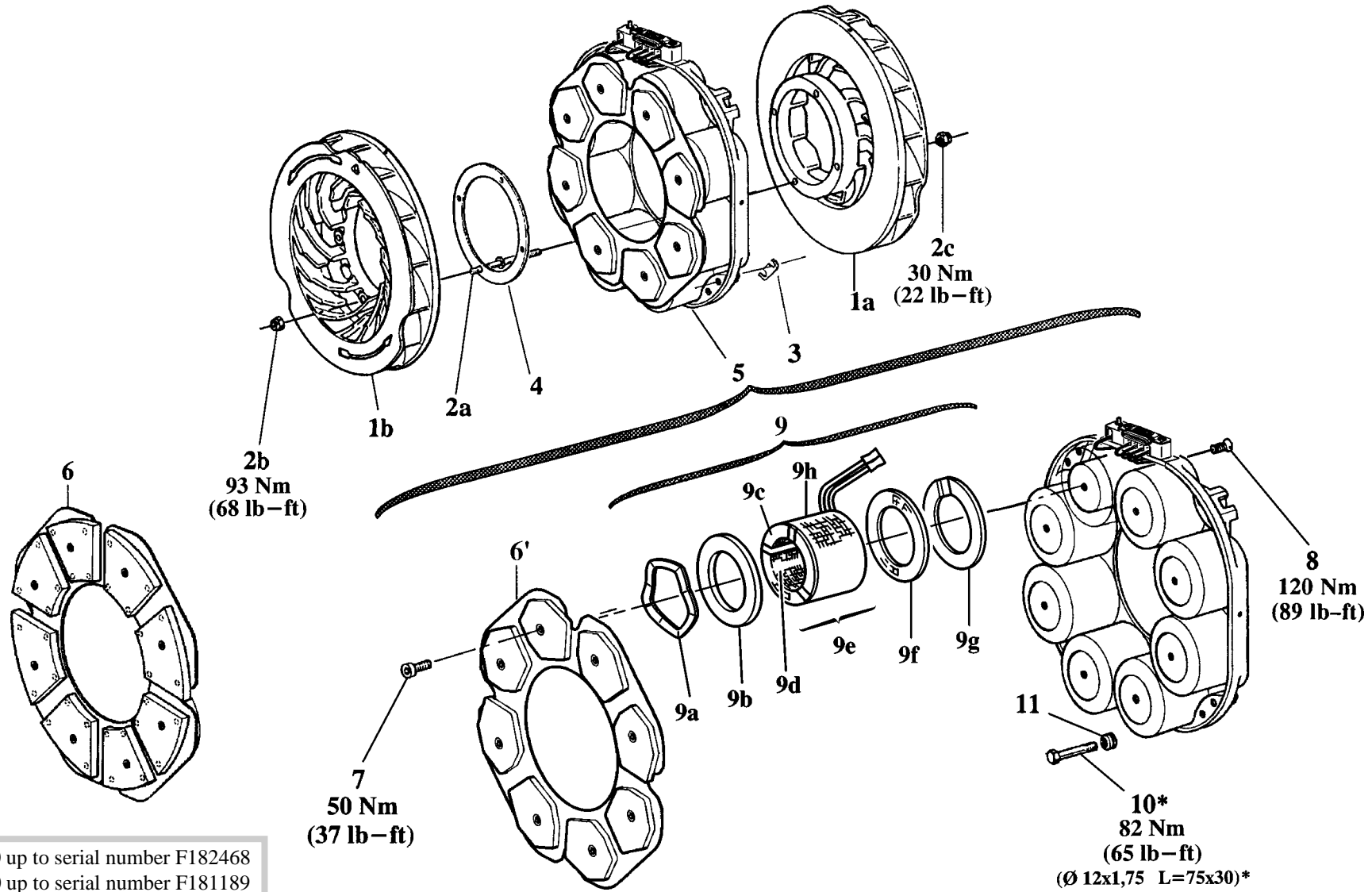
Exploded view and list of spare parts

Types: FV71–50 (F151) FV71–70 (F170) FV71–90 (F191)

| FOCAL RETARDER TYPE | | | FV71–50 (FOCAL 151) | | FV71–70 (FOCAL 170) | | FV71–90 (FOCAL 191) | | |
|-------------------------------|---------------------------------------|-----|---|---------------|--------------------------------------|---------------|--------------------------------------|---------------|----------|
| Fitting on gearbox or on axle | | | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | |
| Retarder part number | | | 12V | not available | FD831100 | FD621100 | FD611100 | not available | FD791100 |
| | | | 24V | FD392100 | FD832100 | FD622100 | FD612100 | FD742100 | FD792100 |
| Item | Description | Qty | PART NUMBERS | | | | | | |
| 1 | Balanced rotors assembly, including: | 1 | VB101390 | | VB101390 | | VB101390 | | |
| | 1a 1 clockwise rotor | | The rotors are only supplied as a matched balanced pair | | | | | | |
| | 1b 1 counter clockwise rotor | | | | | | | | |
| 2 | Set of rotor fasteners, including: | 1 | VB200620 | | VB200620 | | VB200620 | | |
| | 2a 4 shouldered studs | | VF130540 | | VF130540 | | VF130540 | | |
| | 2b/2c 8 metal locknuts | | VF120160 | | VF120160 | | VF120160 | | |
| 3 | Set of stator air gap adjusting shims | 1 | VB200330 | | VB200330 | | VB200330 or VB202068** | | |
| 4 | Set of rotor air gap adjusting shims | 1 | VB200300 | | VB200300 | | VB200300 | | |
| 5 | Stator assembly 12V | 1 | not available | VB107490 | VB107480 | VB107488 | not available | VB107491 | |
| | Stator assembly 24V | 1 | VB107486 | VB107494 | VB107484 | VB107492 | VB107487 | VB107495 | |
| 6 or 6' | Pole shoe plate * | 1 | VB105600 | VB105610 | VB101200 | | VB105600 | VB105610 | |
| | Pole shoe plate | 1 | VB107541 | VB107540 | VB107541 | VB107540 | VB107541 | VB107540 | |
| 7 | Socket cap screw M10x1.5 | 8 | VF108280 | | VF108280 | | VF108280 | | |
| 8 | 90° countersunk screw M14x2 | 8 | VF109110 | | VF109110 | | VF109110 | | |
| 9 or 9' | Spare coil assembly * | 8 | VD310438 | | VD310439 | | VD310439 | | |
| | Spare coil assembly | 8 | VD310571 | | VD310572 | | VD310573 | | |
| 10 | Stator securing screw | 8 | VF100630 | | VF100630 | | VF100630 | | |
| 11 | Trep washer | 8 | VF201400 | | VF201400 | | VF201400 | | |
| ** only for FD472100 retarder | | | * up to serial number F182468 | | * up to serial number F181189 | | * up to serial number F180897 | | |

Exploded view and list of spare parts

Types: FN72-00 (F2000) FN72-20 (F2200) FN72-40 (F2400)



F2000 up to serial number F182468
 F2200 up to serial number F181189

* NOTE: screw length L may vary for some applications.

Exploded view and list of spare parts

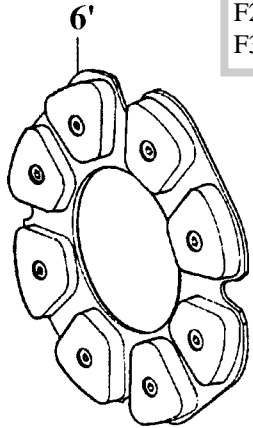
Types: FN72-00 (F2000) FN72-20 (F2200) FN72-40 (F2400)

| FOCAL RETARDER TYPE | | FN72-00 (FOCAL 2000) | | FN72-20 (FOCAL 2200) | | FN72-40 (FOCAL 2400) | | |
|-------------------------------|---------------------------------------|-------------------------|---|-------------------------|----------------------------------|-------------------------|------------------------|----------|
| | | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | |
| Fitting on gearbox or on axle | | 12V | not available | DH311100 | not available | DJ311100 | not available | DK311100 |
| Retarder part number | | 24V | DH202100 | DH312100 | DJ202100 | DJ312100 | DK202100 | DK312100 |
| Item | Description | Qty | PART NUMBERS | | | | | |
| 1 | Balanced rotors assembly, including: | 1 | VB106807 | | VB106807 | | VB106807 | |
| | 1a 1 clockwise rotor | | The rotors are only supplied as a matched balanced pair | | | | | |
| | 1b 1 counter clockwise rotor | | | | | | | |
| 2 | Set of rotor fasteners, including: | 1 | VB200620 | | VB200620 | | VB200620 | |
| | 2a 4 shouldered studs | | VF130540 | | VF130540 | | VF130540 | |
| | 2b/2c 8 metal locknuts | | VF120160 | | VF120160 | | VF120160 | |
| 3 | Set of stator air gap adjusting shims | 1 | VB200330 | | VB200330 | | VB200330 ou VB202068** | |
| 4 | Set of rotor air gap adjusting shims | 1 | VB200300 | | VB200300 | | VB202045 | |
| 5 | Stator assembly 12V | 1 | not available | VB107547 | not available | VB107551 | not available | VB107372 |
| | Stator assembly 24V | 1 | VB107544 | VB107545 | VB107548 | VB107549 | VB107255 | VB107388 |
| 6 or 6' | Pole shoe plate * | 1 | VB106220 | VB106980 | VB106220 | VB106980 | / | / |
| | Pole shoe plate | 1 | VB107541 | VB107540 | VB107541 | VB107540 | VB107541 | VB107540 |
| 7 | Socket cap screw M10x1.5 | 8 | VF108280 | | VF108280 | | VF108280 | |
| 8 | 90° countersunk screw M14x2 | 8 | VF109110 | | VF109110 | | VF109110 | |
| 9 | Spare coil assembly | 8 | VD310452 | | VD310453 | | VD310497 | |
| 10 | Stator securing screw | 8 | VF100630 | | VF100630 | | VF100630 | |
| 11 | Trep washer | 8 | VF201400 | | VF201400 | | VF201400 | |
| ** only for DK322100 retarder | | | * up to serial n° F182468 | | * up to serial n° F181189 | | | |

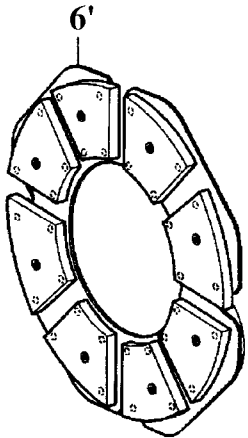
Exploded view and list of spare parts

Types: (F250) FV82-70 (F271) FV82-60 (F272) FV83-00 (F301)

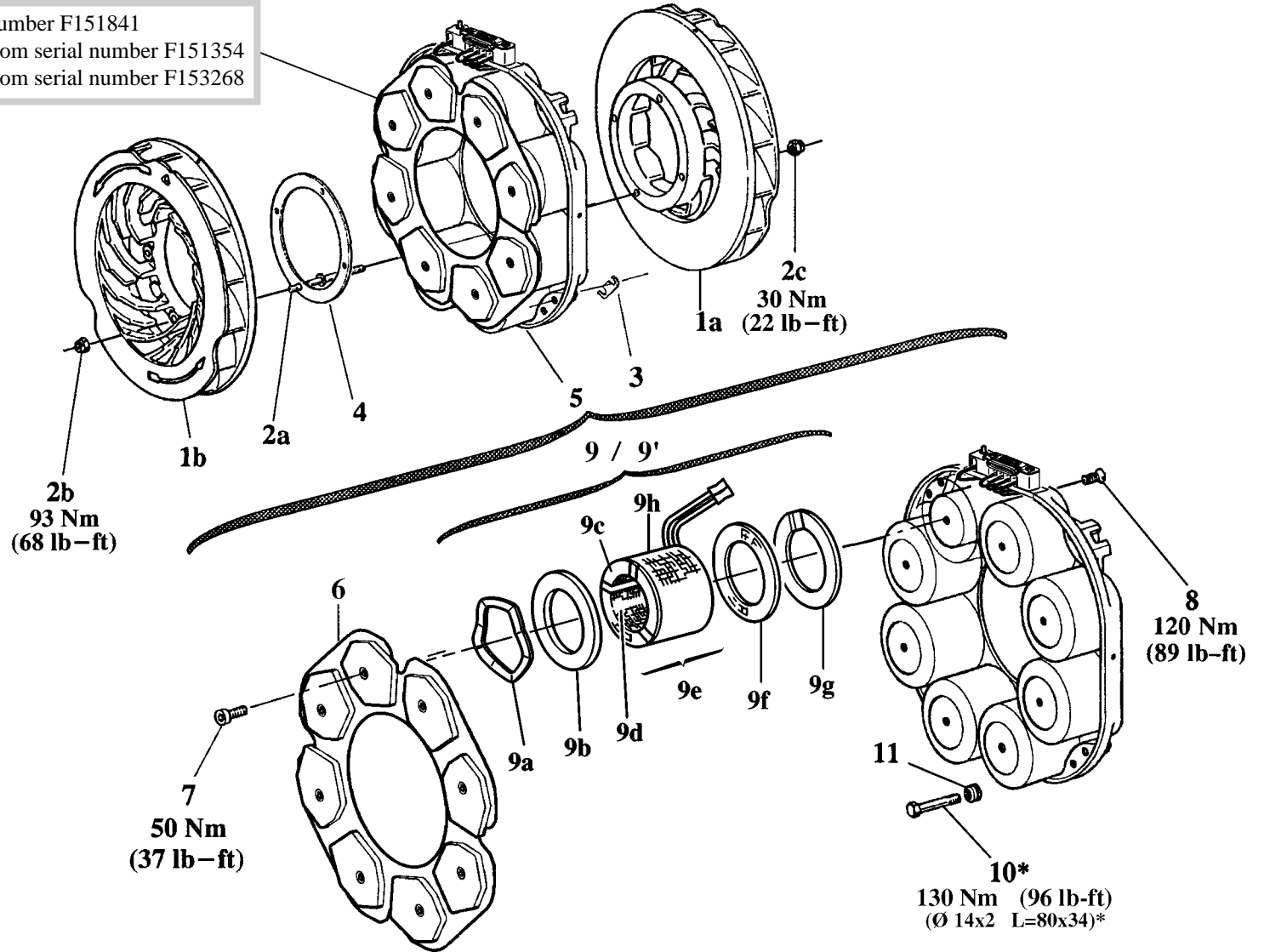
F250 from serial number F151841
 F271 / FV82-70 from serial number F151354
 F301 / FV83-00 from serial number F153268



F250 up to serial number F151840



F271 up to serial number F151353
 F301 up to serial number F153267



* NOTE: screw length L may vary for some applications.

Exploded view and list of spare parts

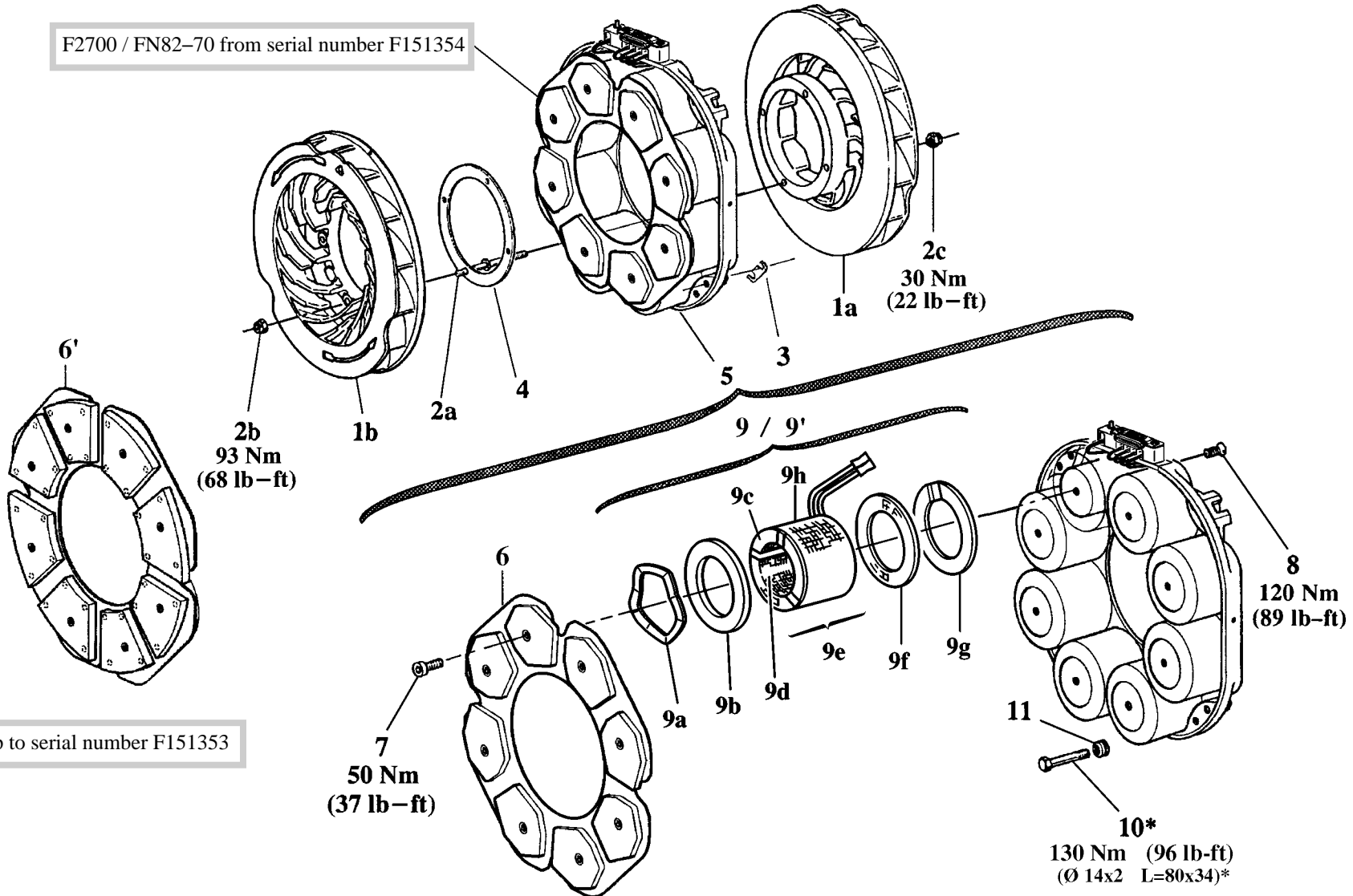
Types: (F250) FV82-70 (F271) FV82-60 (F272) FV83-00 (F301)

| FOCAL RETARDER TYPE | | (FOCAL 250) | | FV82-70 (FOCAL 271) | | FV82-60 (FOCAL 272) | | FV83-00 (FOCAL 301) | | |
|----------------------|---------------------------------------|------------------|---|------------------------|---------------|------------------------|--------------------------------------|------------------------|-------------------------------------|--------------|
| | | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | |
| Retarder part number | | 12V | not available | not available | not available | not available | not feasible | not feasible | not feasible | not feasible |
| | | 24V | FF662100 | not available | FF742100 | not available | DR202100 | not available | FF702100 | FF752100 |
| Item | Description | Qty | PART NUMBERS | | | | | | | |
| 1 | Balanced rotors assembly, including: | 1 | VB101400 | / | VB101400 | / | VB101400 | / | VB101400 | / |
| 1a | 1 clockwise rotor | | The rotors are only supplied as a matched balanced pair | | | | | | | |
| 1b | 1 counter clockwise rotor | | | | | | | | | |
| 2 | Set of rotor fasteners, including: | 1 | VB200630 | / | VB200630 | / | VB200630 | / | VB200630 | |
| 2a | 8 shouldered studs | | VF130540 | / | VF130540 | / | VF130540 | / | VF130540 | |
| 2b/2c | 16 metal locknuts | | VF120160 | / | VF120160 | / | VF120160 | / | VF120160 | |
| 3 | Set of stator air gap adjusting shims | 1 | VB200340 | / | VB200340 | / | VB200340 | / | VB200340 | |
| 4 | Set of rotor air gap adjusting shims | 1 | VB200310 | / | VB200310 | / | VB200310 | / | VB200310 | |
| 5 | Stator assembly 12V | 1 | not available | / | not available | / | not feasible | / | not feasible | not feasible |
| | Stator assembly 24V | 1 | VB107426 | / | VB107427 | / | / | / | VB107428 | VB107760 |
| 6 or 6' | Pole shoe plate * | 1 | VB101220 | / | VB105620 | / | / | / | VB105620 | / |
| | Pole shoe plate | 1 | VB106904 | / | VB106904 | / | VB106904 | / | VB106904 | VB106981 |
| 7 | Socket cap screw M10x1.5 | 8 | VF108280 | / | VF108280 | / | VF108280 | / | VF108280 | |
| 8 | 90° countersunk screw M14x2 | 8 | VF109110 | / | VF109110 | / | VF109110 | / | VF109110 | |
| 9 or 9' | Spare coil assembly * | 8 | VD310441 | / | VD310441 | / | / | / | VD310442 | / |
| | Spare coil assembly | 8 | VD310524 | / | VD310525 | / | VD310627 | / | VD310526 | |
| 10 | Stator securing screw | 8 | VF100870 | / | VF100870 | / | VF100870 | / | VF100870 | |
| 11 | Trep washer | 8 | VF201410 | / | VF201410 | / | VF201410 | / | VF201410 | |
| | | | * up to serial number F151840 | | | | * up to serial number F151353 | | *up to serial number F153267 | |

Exploded view and list of spare parts

Types: FN82-70 (F2700) FN83-00 (F3000) FN83-30 (F3300)

F2700 / FN82-70 from serial number F151354



F2700 up to serial number F151353

* NOTE: screw length L may vary for some applications.

Exploded view and list of spare parts

Types: FN82–70 (F2700) FN83–00 (F3000) FN83–30 (F3300)

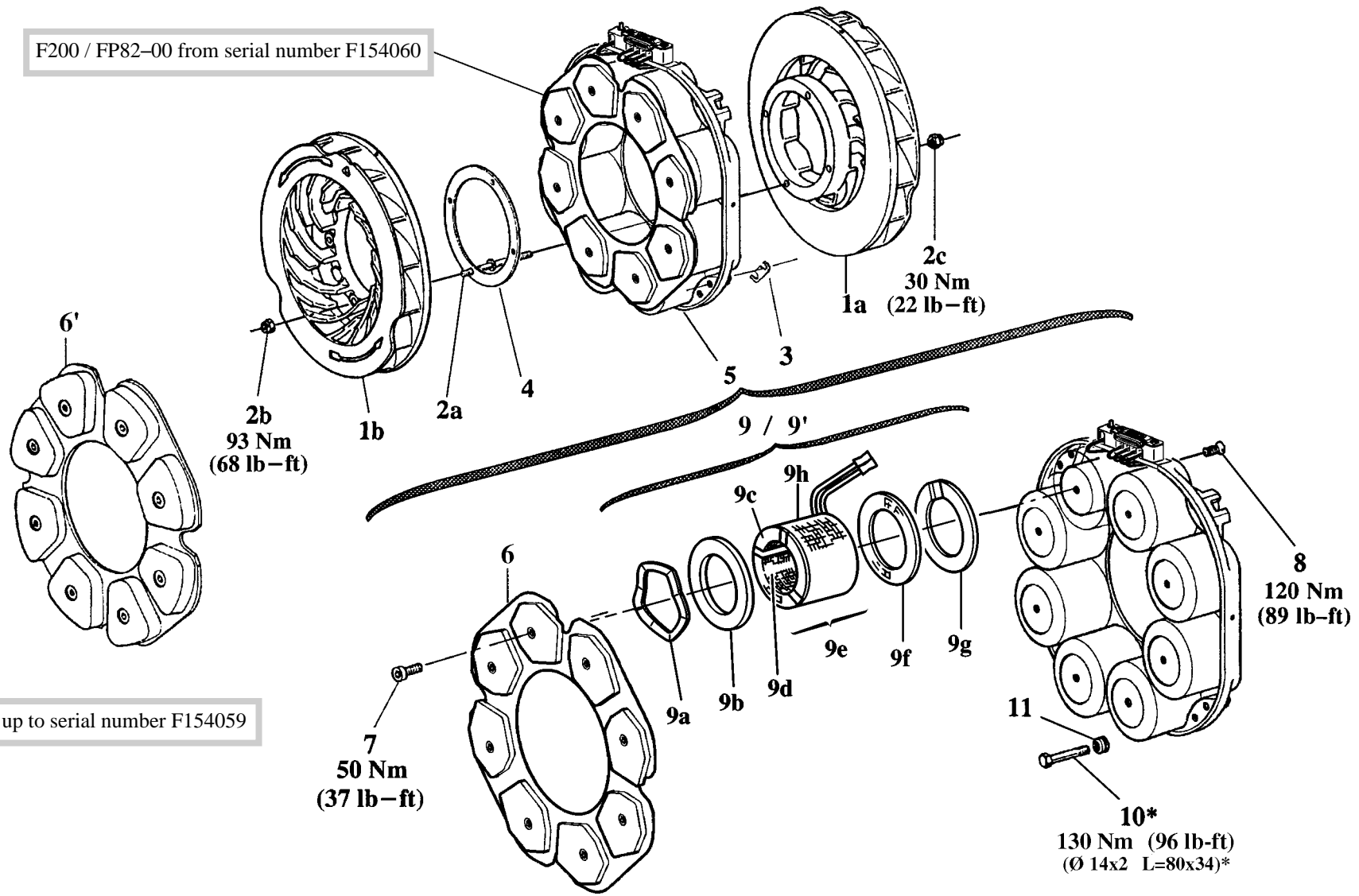
| FOCAL RETARDER TYPE | | FN82–70 (FOCAL 2700) | | FN83–00 (FOCAL 3000) | | FN83–30 (FOCAL 3300) | | |
|-------------------------------|---------------------------------------|-------------------------|---|-------------------------|---------------|-------------------------|---------------|--------------|
| | | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | |
| Fitting on gearbox or on axle | | 12V | not available | not available | not feasible | not feasible | not feasible | not feasible |
| Retarder part number | | 24V | DL202100 | not available | DN202100 | DN312100 | DP202100 | DP312100 |
| Item | Description | Qty | PART NUMBERS | | | | | |
| 1 | Balanced rotors assembly, including: | 1 | VB107433 | / | VB106808 | | VB106808 | |
| 1a | 1 clockwise rotor | | The rotors are only supplied as a matched balanced pair | | | | | |
| 1b | 1 counter clockwise rotor | | | | | | | |
| 2 | Set of rotor fasteners, including: | 1 | VB200630 | / | VB200630 | | VB200630 | |
| 2a | 8 shouldered studs | | VF130540 | / | VF130540 | | VF130540 | |
| 2b/2c | 16 metal locknuts | | VF120160 | / | VF120160 | | VF120160 | |
| 3 | Set of stator air gap adjusting shims | 1 | VB200340 | / | VB200340 | | VB200340 | |
| 4 | Set of rotor air gap adjusting shims | 1 | VB200310 | / | VB200310 | | VB200310 | |
| 5 | Stator assembly 12V | 1 | not available | / | not feasible | not feasible | not feasible | not feasible |
| | Stator assembly 24V | 1 | VB107427 | / | VB106790 | VB107761 | VB106902 | VB107762 |
| 6 or 6' | Pole shoe plate * | 1 | VB105620 | / | / | / | / | / |
| | Pole shoe plate | 1 | VB106904 | / | VB106904 | VB106981 | VB106904 | VB106981 |
| 7 | Socket cap screw M10x1.5 | 8 | VF108280 | / | VF108280 | | VF108280 | |
| 8 | 90° countersunk screw M14x2 | 8 | VF109110 | / | VF109110 | | VF109110 | |
| 9 or 9' | Spare coil assembly * | 8 | VD310441 | / | / | | / | |
| | Spare coil assembly | 8 | VD310525 | / | VD310454 | | VD310466 | |
| 10 | Stator securing screw | 8 | VF100870 | / | VF100870 | | VF100870 | |
| 11 | Trep washer | 8 | VF201410 | / | VF201410 | | VF201410 | |

* up to serial number **F151353**

Exploded view and list of spare parts

Types: FP82-00 (F200) FP82-70

F200 / FP82-00 from serial number F154060



F200 up to serial number F154059

* NOTE: screw length L may vary for some applications.

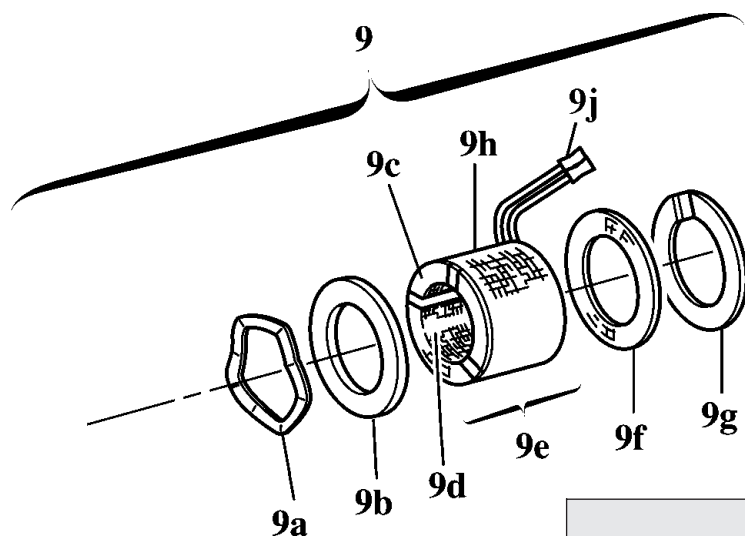
Exploded view and list of spare parts

Types: FP82-00 (F200) FP82-70

| FOCAL RETARDER TYPE | | FP82-00 (FOCAL 200) | | FP82-70 | | |
|-------------------------------|---------------------------------------|------------------------|---|------------------|---------------|---|
| | | Gearbox mounting | Axle mounting | Gearbox mounting | Axle mounting | |
| Fitting on gearbox or on axle | | 12V | not available | not available | not available | |
| Retarder part number | | 24V | FS622100 | not available | DS202100 | |
| Item | Description | Qty | PART NUMBERS | | | |
| 1 1a 1b | Balanced rotors assembly, including: | 1 | VB105300 | / | VB105300 | / |
| | 1 clockwise rotor | | The rotors are only supplied as a matched balanced pair | | | |
| | 1 counter clockwise rotor | | | | | |
| 2 2a 2b/2c | Set of rotor fasteners, including: | 1 | VB200630 | / | / | / |
| | 8 shouldered studs | | VF130540 | / | VF130591 | / |
| | 16 metal locknuts | | VF120160 | / | VF120160 | / |
| 3 | Set of stator air gap adjusting shims | 1 | VB200340 | / | VB200340 | / |
| 4 | Set of rotor air gap adjusting shims | 1 | VB200310 | / | VB200310 | / |
| 5 | Stator assembly 12V | 1 | not available | / | not available | / |
| | Stator assembly 24V | 1 | VB107425 | / | VB107763 | / |
| 6 or 6' | Pole shoe plate * | 1 | VB101220 | / | / | / |
| | Pole shoe plate | 1 | VB106904 | / | VB106904 | / |
| 7 | Socket cap screw M10x1.5 | 8 | VF108280 | / | VF108280 | / |
| 8 | 90° countersunk screw M14x2 | 8 | VF109110 | / | VF109110 | / |
| 9 or 9' | Spare coil assembly * | 8 | VD310481 | / | / | / |
| | Spare coil assembly | 8 | VD310523 | / | VD310633 | / |
| 10 | Stator securing screw | 8 | VF100870 | / | VF100870 | / |
| 11 | Trep washer | 8 | VF201410 | / | VF201410 | / |

* up to serial number **F154059**

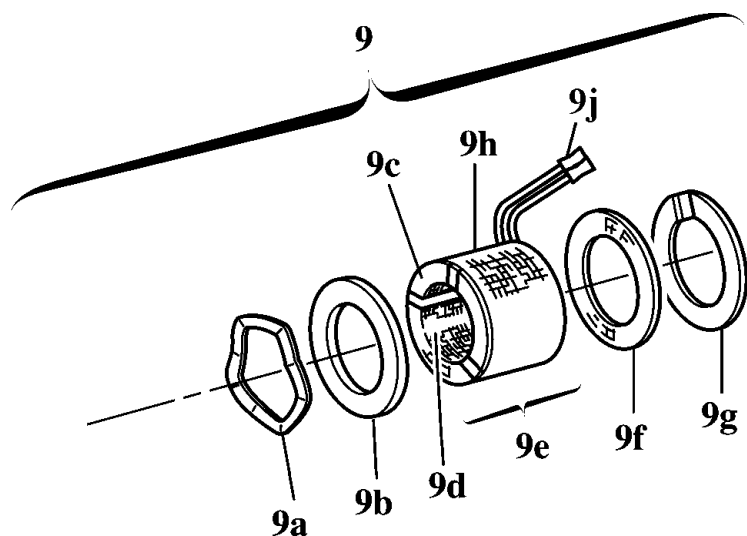
Spare coil assembly



| FOCAL types | | | | | | | | | |
|------------------------|------------------------|------------------------|------------------------|------------------------|---------------------|------------------------|-------------------------|-------------------------|-------------------------|
| FV60-90 (FOCAL 90) | FV61-30 (FOCAL 130) | from serial number | | | up to serial number | | FN72-00 (FOCAL 2000) | FN72-20 (FOCAL 2200) | FN72-40 (FOCAL 2400) |
| | FV61-31 | F182469 | F181190 | F180898 | F182468 | F181189 F180897 | | | |
| FV61-00 (FOCAL 101) | FV61-40 (FOCAL 141) | FV71-50 (FOCAL 151) | FV71-70 (FOCAL 170) | FV71-90 (FOCAL 191) | FOCAL 151 | FOCAL 170 FOCAL 191 | | | |

| Item | Description | Part numbers | | | | | | | | | |
|----------|---|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 9 | Spare coil assembly, including: | VD310504 | VD310437 | VD310571 | VD310572 | VD310573 | VD310438 | VD310439 | VD310452 | VD310453 | VD310497 |
| 9a | Pressure washer | VB501460 | VB501460 | VB514766 | VB514766 | VB514766 | VB514766 | VB514766 | VB514766 | VB514766 | VB515405 |
| 9b | Coil end protective cover | VD503659 | VD503517 | VD503688 | VD503689 | VD503689 | VD503624 | VD503523 | VD503522 | VD503522 | VD503624 |
| 9c | Coil end insulator (pole shoe plate side) | / | / | / | / | / | VD503632 | VD503575 | / | / | / |
| 9d | Set of 8 pole insulators | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 |
| 9e | Impregnated coil | supplied under the coil assembly number | | | | | | | | | |
| 9f | Coil end insulator (stator housing side) | VD503569 | VD503569 | VD503632 | VD503632 | VD503632 | VD503632 | VD503632 | VD503632 | VD503632 | VD503625 |
| 9g | Protective washer | VD503543 | VD503543 | VD503544 | VD503544 | VD503544 | VD503544 | VD503544 | VD503544 | VD503544 | VD503627 |
| 9h | Set of 8 external protective sleeves | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 |
| 9j | Set of 16 crimp connectors | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 |

Spare coil assembly



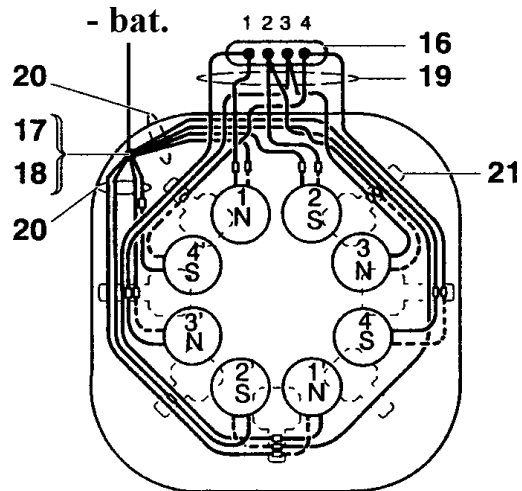
| FOCAL types | | | | | | | | | | |
|------------------------|-------------|---|------------------------|---------------------|--------------------------------------|-----------|-------------------|---------|-------------------------|-------------------------|
| from serial number | | | | up to serial number | | | FV82-60 (F272) | FP82-70 | FN83-00 (FOCAL 3000) | FN83-30 (FOCAL 3300) |
| F154059 | F151840 | F151353 | F153267 | F154060 | F151841 F151354 | F153268 | | | | |
| FP82-00 (FOCAL 200) | (FOCAL 250) | FV82-70 (FOCAL 271) FN82-70 (FOCAL 2700) | FV83-00 (FOCAL 301) | FOCAL 200 | FOCAL 250 FOCAL 271 FOCAL 2700 | FOCAL 301 | | | | |

| Item | Description | Part numbers | | | | | | | | | | |
|------|---|---|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 9 | Spare coil assembly, including: | VD310523 | VD310524 | VD310525 | VD310526 | VD310481 | VD310441 | VD310442 | VD310627 | VD310633 | VD310454 | VD310466 |
| 9a | Pressure washer | VB510410 | VB510410 | VB510410 | VB510410 | VB509770 | VB509770 | VB509770 | VB510410 | VB510410 | VB510410 | VB510410 |
| 9b | Coil end protective cover | VD503652 | VD503653 | VD503654 | VD503583 | VD503633 | VD503520 | VD503519 | VD503583 | VD503653 | VD503583 | VD503583 |
| 9c | Coil end insulator (pole shoe plate side) | / | / | / | / | VD503634 | VD503532 | VD503572 | / | / | / | / |
| 9d | Set of 8 pole insulators | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 | VB202038 |
| 9e | Impregnated coil | supplied under the coil assembly number | | | | | | | | | | |
| 9f | Coil end insulator (stator housing side) | VD503576 | VD503576 | VD503576 | VD503576 | VD503572 | VD503572 | VD503572 | VD503576 | VD503576 | VD503584 | VD503584 |
| 9g | Protective washer | VD503547 | VD503547 | VD503547 | VD503547 | VD503546 | VD503546 | VD503546 | VD503547 | VD503547 | VD503547 | VD503547 |
| 9h | Set of 8 external protective sleeves | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 | VB202036 |
| 9j | Set of 16 crimp connectors | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 | VD408491 |

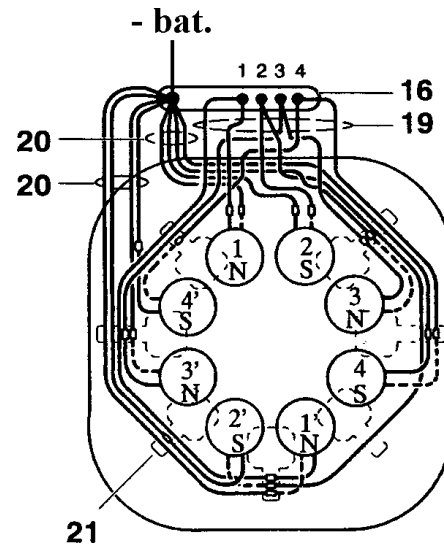
Internal wiring assembly

Wiring assembly – Figure 1

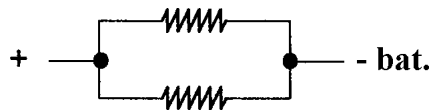
Up to serial number F181463



From serial number F181464



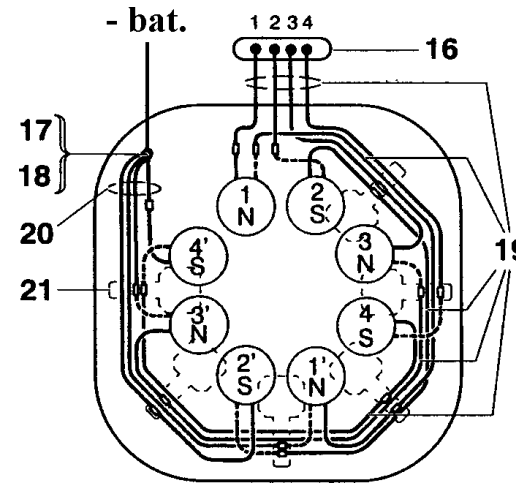
Layout of one stage 12V



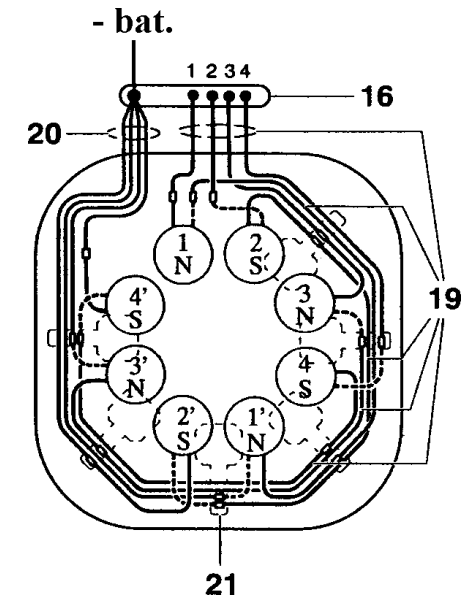
— red sleeve
 - - - blue sleeve

Wiring assembly – Figure 2

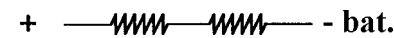
Up to serial number F181463



From serial number F181464



Layout of one stage 24V



— red sleeve
 - - - blue sleeve

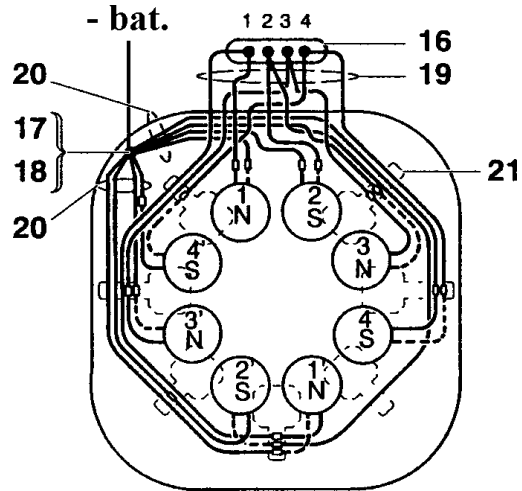
Internal wiring assembly

| Item | Description | Qty | Part numbers for 12 V stator Wiring assembly fig. 1 | | | | | Part numbers for 24 V stator Wiring assembly fig. 2 | | | | | | |
|------|---|-----|--|-----------------------|-----------------------|---------|----------------------|--|----------------------|-----------------------|-----------------------|-----------------------|--|--|
| | | | FV60-90 Focal 90 | FV61-00 Focal 101 | FV61-30 Focal 130 | FV61-31 | FV61-40 Focal 141 | FV60-90 Focal 90 | FV61-00 Focal 101 | FV61-30 Focal 130 | FV61-31 | FV61-40 Focal 141 | | |
| | | | FV71-50 Focal 151 | FV71-70 Focal 170 | FV71-90 Focal 191 | | | FV71-50 Focal 151 | FV71-70 Focal 170 | FV71-90 Focal 191 | | | | |
| | | | FN72-00 Focal 2000 | FN72-20 Focal 2200 | FN72-40 Focal 2400 | | | | | FN72-00 Focal 2000 | FN72-20 Focal 2200 | FN72-40 Focal 2400 | | |
| 16 | Connecting block assembly (page 30) | 1 | VD408074 or VD408041 | | | | | VD408074 or VD408041 | | | | | | |
| 17 | Earth terminal (page 31) | 1 | VD408298 | | | | | VD408298 | | | | | | |
| 18 | Earth cable terminal | 1 | See table on page 31 | | | | | See table on page 31 | | | | | | |
| 19 | Wiring assembly | 1 | VD408565 | | | | | VD408566 | | | | | | |
| 20 | Earth wiring assembly | 2 | VD408564 | | | | | / | | | | | | |
| | | 1 | / | | | | | VD408564 | | | | | | |
| 21 | Set of 8 cable securing plates | 1 | VD408047 | | | | | VD408047 | | | | | | |
| | 1 kg can of araldite for bonding the coils on the poles | | VH510160 | | | | | VH510160 | | | | | | |
| | 400 g can of hardener for araldite | | VH510310 | | | | | VH510310 | | | | | | |
| | 1 l can of cable protective varnish | | VH510440 | | | | | VH510440 | | | | | | |
| | Tube of silicone compound | | VH510130 | | | | | VH510130 | | | | | | |

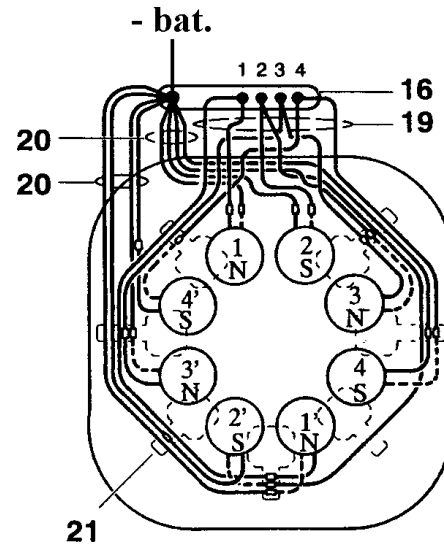
Internal wiring assembly

Wiring assembly – Figure 1

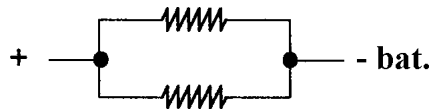
Up to serial number F181463



From serial number F181464



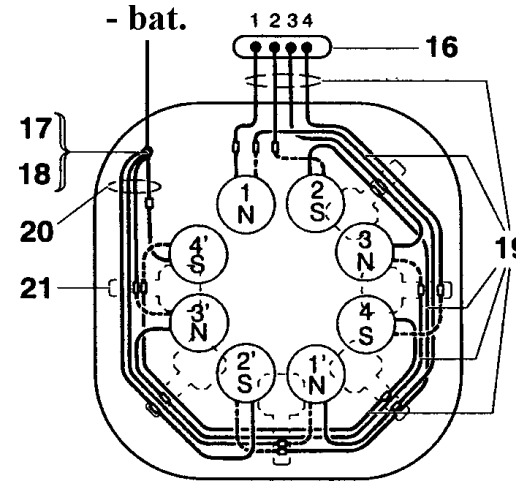
Layout of one stage 12V



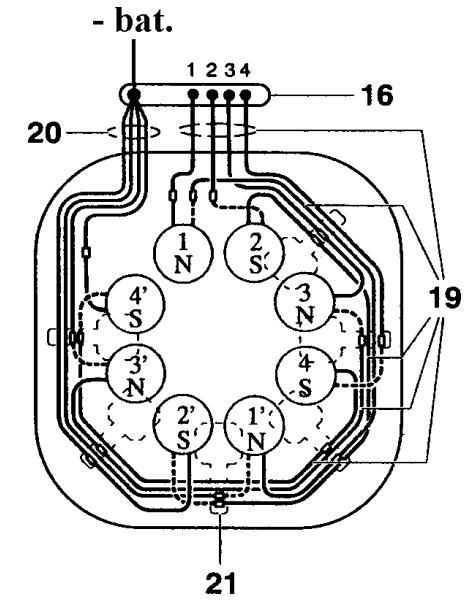
— red sleeve
 - - - blue sleeve

Wiring assembly – Figure 2

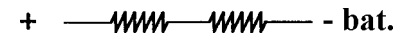
Up to serial number F181463



From serial number F181464



Layout of one stage 24V



— red sleeve
 - - - blue sleeve

Internal wiring assembly

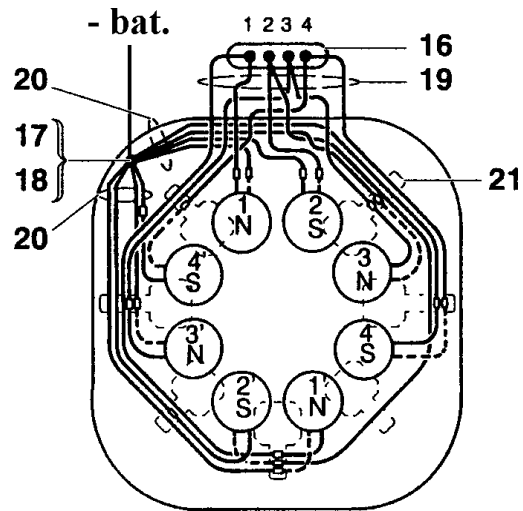
| Item | Description | Qty | Part numbers for 12 V stator Wiring assembly fig. 1 | | | | Part numbers for 24 V stator Wiring assembly fig. 2 | | | |
|------|---|-----|--|----------------------|-----------------------|-----------------------------|--|----------------------|-----------------------|--|
| | | | FP82-70 Focal 250 | FV82-70 Focal 271 | FN82-70 Focal 2700 | FP82-00 Focal 200 *** | FP82-70 Focal 250 | FV82-70 Focal 271 | FN82-70 Focal 2700 | |
| 16 | Connecting block assembly (page 30) | 1 | VD408074 or VD408041 | | | | VD408074 or VD408041 | | | |
| 17 | Insulated earth terminal (page 31) | 1 | VD408046 | | | | VD408046 | | | |
| 18 | Earth cable terminal | 1 | See table on page 31 | | | | See table on page 31 | | | |
| 19 | Wiring assembly | 1 | VD408565 | | | | VD408566 | | | |
| 20 | Earth wiring assembly | 2 | VD408564 | | | | / | | | |
| | | 1 | / | | | | VD408564 | | | |
| 21 | Set of 8 cable securing plates | 1 | VD408047 | | | | VD408047 | | | |
| | 1 kg can of araldite for bonding the coils on the poles | | VH510160 | | | | VH510160 | | | |
| | 400 g can of hardener for araldite | | VH510310 | | | | VH510310 | | | |
| | 1 l can of cable protective varnish | | VH510440 | | | | VH510440 | | | |
| | Tube of silicone compound | | VH510130 | | | | VH510130 | | | |

*** : F200, 24V from serial number F154060 (for the previous serial numbers, see page 25)

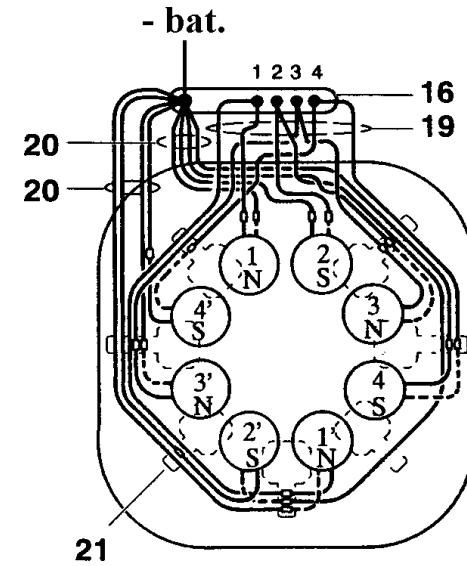
Internal wiring assembly

Wiring assembly – Figure 1

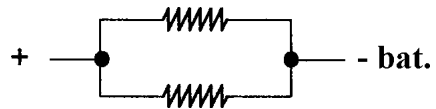
Up to serial number F181463



From serial number F181464



Layout of one stage



— red sleeve
 - - - blue sleeve

Internal wiring assembly

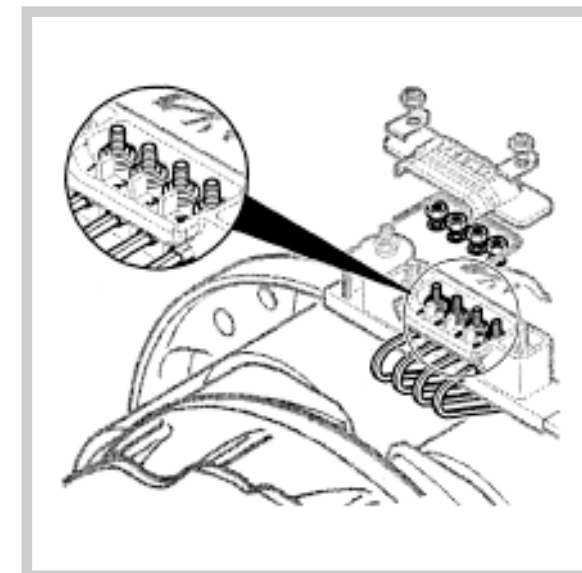
| Item | Description | Qty | Part numbers for 24 V stator Wiring assembly fig. 1 | | | | |
|------|---|-----|--|----------------------|----------------------|-----------------------|-----------------------|
| | | | Focal 200 ** | FV82-60 Focal 272 | FV83-00 Focal 301 | FN83-00 Focal 3000 | FN83-30 Focal 3300 |
| 16 | Connecting block assembly (page 30) | 1 | VD408074 or VD408041 | | | | |
| 17 | Insulated earth terminal (page 31) | 1 | VD408046 | | | | |
| 18 | Earth cable terminal | 1 | See table on page 31 | | | | |
| 19 | Wiring assembly | 1 | VD408565 | | | | |
| 20 | Earth wiring assembly | 2 | VD408564 | | | | |
| 21 | Set of 8 cable securing plates | 1 | VD408047 | | | | |
| | 1 kg can of araldite for bonding the coils on the poles | | VH510160 | | | | |
| | 400 g can of hardener for araldite | | VH510310 | | | | |
| | 1 l can of cable protective varnish | | VH510440 | | | | |
| | Tube of silicone compound | | VH510130 | | | | |

** : F200, 24 V up to serial number F154059

Chart for cutting the single wires on the connecting block and the wires between the coils

According to retarder type, cut the 8 wires to the dimensions I1, I2, I3, I4 and L (4x) and remove 5 mm insulation from each end.

| Retarder type | Figure 1 | | | | Figure 2 |
|---|-----------------|-----------------|------------------|------------------|---------------------------|
| | Terminal 1 | Terminal 2 | Terminal 3 | Terminal 4 | 4 wires between the coils |
| | I1 | I2 | I3 | I4 | L |
| F90 / FV60-90 F101 / FV61-00 F130 / FV61-30 FV61-31 F141 / FV61-41 | 215 mm 8.5 " | 215 mm 8.5 " | 635 mm 25 " | 505 mm 19.9 " | 840 mm 33.1 " |
| F151 / FV71-50 F170 / FV71-70 F191 / FV71-90 F2000 / FN72-00 F2200 / FN72-20 F2400 / FN72-40 | 230 mm 9.1 " | 230 mm 9.1 " | 660 mm 26 " | 540 mm 21.3 " | 920 mm 36.2 " |
| * F200 / FP82-00 F250 F271 / FV82-70 FP82-70 F2700 / FN82-70 | 250 mm 9.8 " | 250 mm 9.8 " | 690 mm 27.2 " | 580 mm 22.8 " | 1010 mm 39.8 " |



* for F200 / FP82-00 from serial number F154060

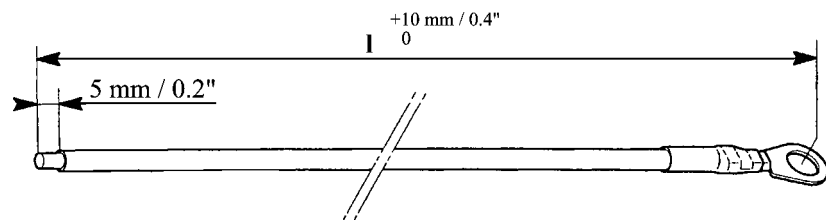


Figure 1

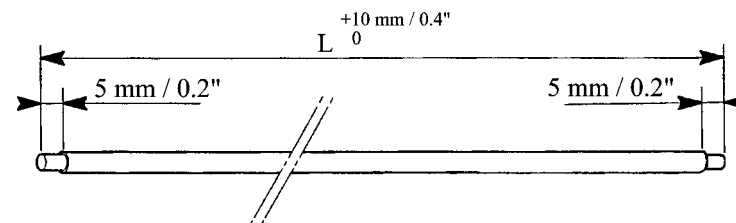


Figure 2

Chart for cutting the double wires on the connecting block

According to retarder type, cut the 8 wires to the dimensions I1, I2, I3, I4, L1, L2, L3 and L4 and remove 5 mm insulation from each end.

| Retarder type | Terminal 1 | | Terminal 2 | | Terminal 3 | | Terminal 4 | |
|---|------------------|-------------------|------------------|-------------------|------------------|------------------|------------------|------------------|
| | I1 | L1 | I2 | L2 | I3 | L3 | I4 | L4 |
| F90 / FV60-90 F101 / FV61-00 F130 / FV61-30 FV61-31 F141 / FV61-41 | 235 mm 9.2 " | 885 mm 34.8 " | 235 mm 9.2 " | 885 mm 34.8 " | 525 mm 20.7 " | 655 mm 25.8 " | 525 mm 20.7 " | 655 mm 25.8 " |
| F151 / FV71-50 F170 / FV71-70 F191 / FV71-90 F2000 / FN72-00 F2200 / FN72-20 F2400 / FN72-40 | 250 mm 9.8 " | 970 mm 38.2 " | 250 mm 9.8 " | 970 mm 38.2 " | 600 mm 23.6 " | 680 mm 26.8 " | 600 mm 23.6 " | 680 mm 26.8 " |
| * F200 F272 / FV82-60 F301 / FV83-00 F3000 / FN83-00 F3300 / FN83-30 | 290 mm 11.4 " | 1080 mm 42.5 " | 290 mm 11.4 " | 1080 mm 42.5 " | 650 mm 25.6 " | 720 mm 28.3 " | 650 mm 25.6 " | 720 mm 28.3 " |

* for F200 up to serial number F154059.

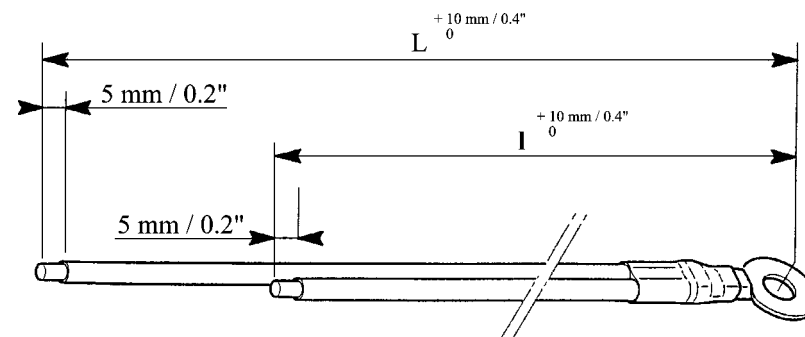
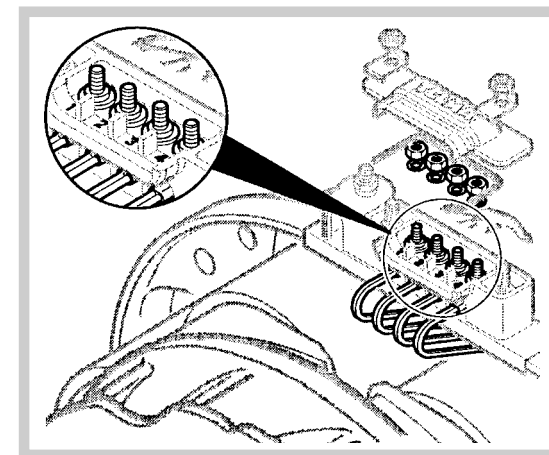


Chart for cutting the earth return wires (version of connecting block with integrated earth)

According to retarder type, cut the 4 wires to the dimensions L1, L2, L3 and L4 and remove 5 mm insulation from each end.

| Retarder type | Voltage | L1 | L2 | L3 | L4 |
|---|---------|------------------|------------------|------------------|-------------------|
| F90 / FV60-90 F101 / FV61-00 F130 / FV61-30 FV61-31 F141 / FV61-41 | 12V | 245 mm 9.6 " | 595 mm 23.4 " | 655 mm 25.8 " | 1015 mm 40 " |
| | 24V | 455 mm 17.9 " | 535 mm 21.1 " | 835 mm 32.9 " | 905 mm 35.6 " |
| F151 / FV71-50 F170 / FV71-70 F191 / FV71-90 F2000 / FN72-00 F2200 / FN72-20 F2400 / FN72-40 | 12V | 315 mm 12.4 " | 645 mm 25.4 " | 695 mm 27.4 " | 1095 mm 43.1 " |
| | 24V | 495 mm 19.5 " | 595 mm 23.4 " | 915 mm 36 " | 995 mm 39.2 " |
| F200 / FP82-00 F250 F271 / FV82-70 FP82-70 F2700 / FN82-70 | 24V | 555 mm 21.8 " | 645 mm 25.4 " | 985 mm 38.8 " | 1075 mm 42.3 " |
| F272 / FV82-60 F301 / FV83-00 F3000 / FN83-00 F3300 / FN83-30 | 24V | 245 mm 9.6 " | 715 mm 28.1 " | 755 mm 29.7 " | 1175 mm 46.2 " |

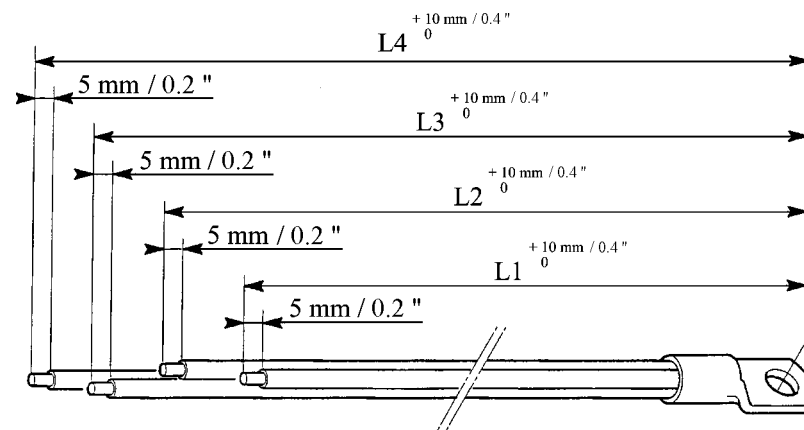
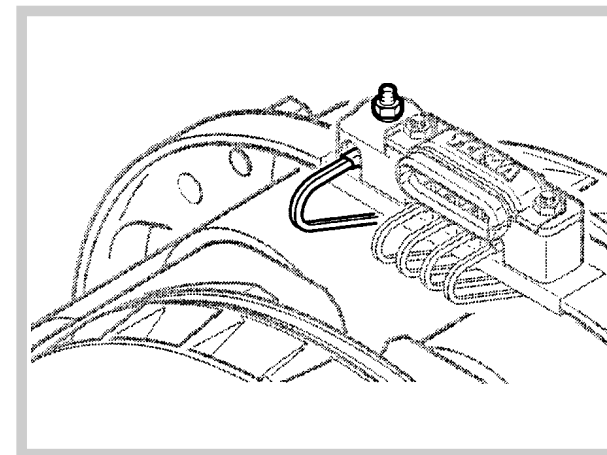
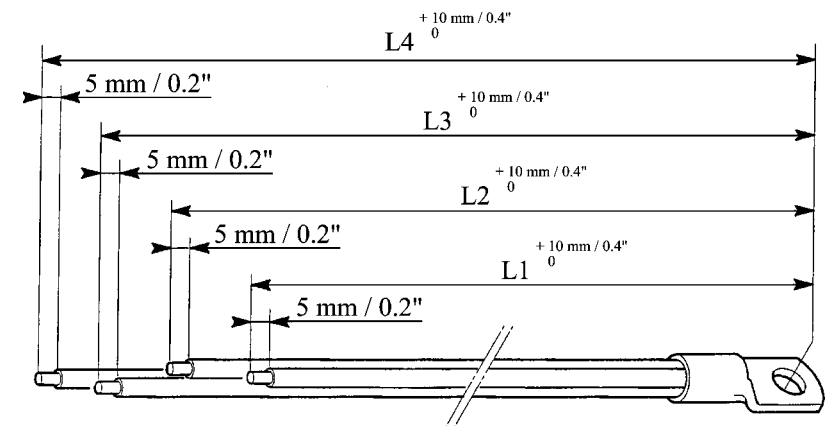
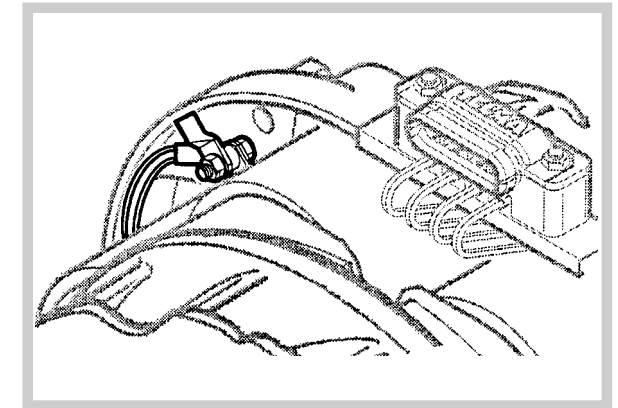


Chart for cutting the earth return wires (version with earth return terminal on the stator housing)

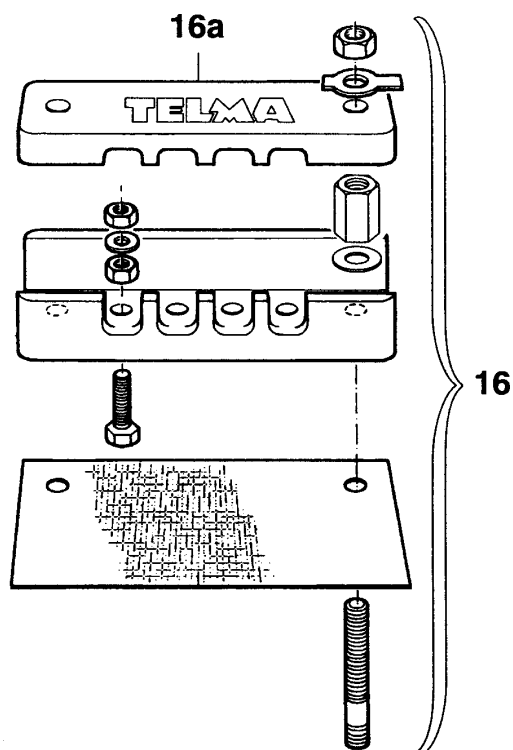
According to retarder type, cut the 8 wires to the dimensions L1, L2, L3 and L4 and remove 5 mm insulation from each end.

| Retarder | Voltage | L1 | L2 | L3 | L4 |
|--|-------------------|------------------|------------------|------------------|------------------|
| F90 / FV60-90 F101 / FV61-00 F130 / FV61-30 FV61-31 F141 / FV61-41 | 12V and 24V | 245 mm 9.6 " | 345 mm 13.6 " | 625 mm 24.6 " | 715 mm 28.1 " |
| F151 / FV71-50 F170 / FV71-70 F191 / FV71-90 F2000 / FN72-00 F2200 / FN72-20 F2400 / FN72-40 | 12V and 24V | 275 mm 10.8 " | 375 mm 14.8 " | 685 mm 27 " | 795 mm 31.3 " |
| F200 / FP82-00 F250 F271 / FV82-70 FP82-70 F2700 / FN82-70 F272 / FV82-60 F301 / FV83-00 F3000 / FN83-00 F3300 / FN83-30 | 24V | 335 mm 13.2 " | 435 mm 17.1 " | 775 mm 30.5 " | 905 mm 35.6 " |

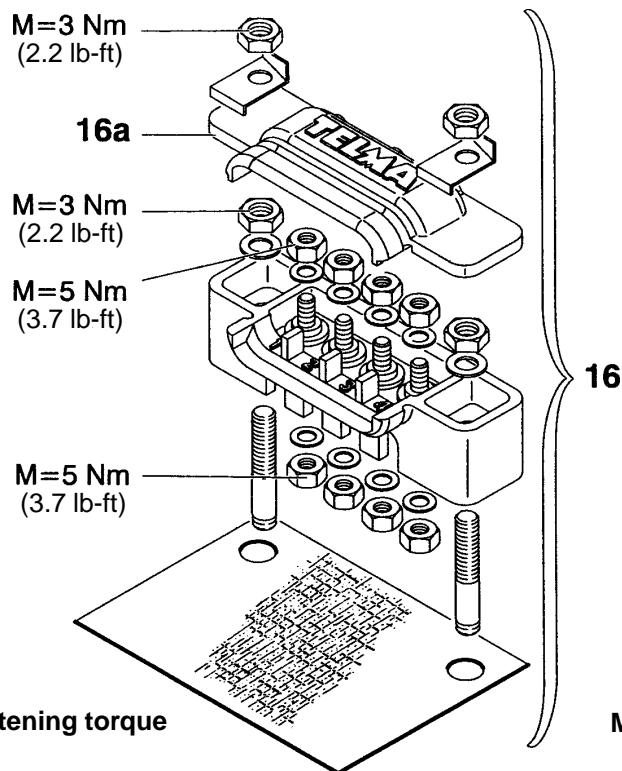


Connecting block assembly

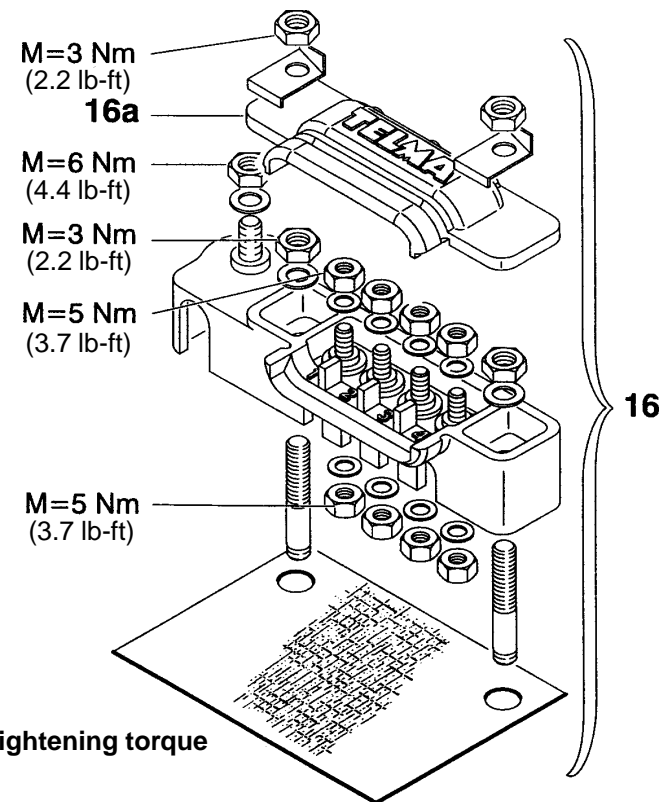
Up to serial number F130995



From serial number F130996
to serial number F181463



From serial number F181464



| Item | Description | Qty | Part number |
|------|--------------------------------------|-----|-------------|
| 16 | Connecting block assembly with cover | 1 | See NOTE |
| 16a | Cover for connecting block | 1 | VD500480 |

| Item | Description | Qty | Part number |
|------|--------------------------------------|-----|-------------|
| 16 | Connecting block assembly with cover | 1 | VD408041 |
| 16a | Cover for connecting block | 1 | VD503622 |

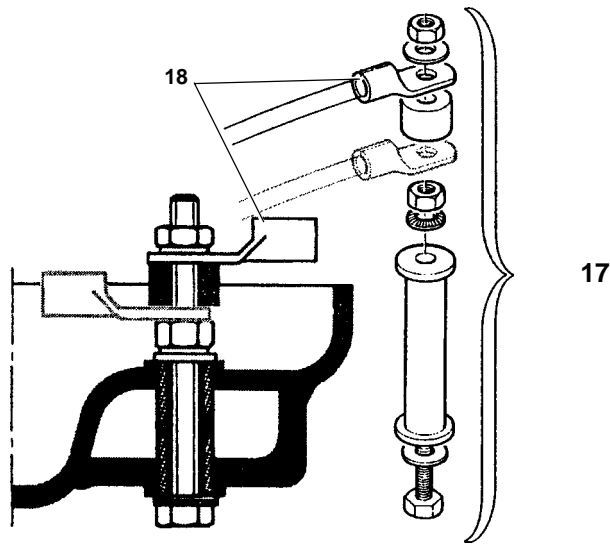
| Item | Description | Qty | Part number |
|------|--------------------------------------|-----|-------------|
| 16 | Connecting block assembly with cover | 1 | VD408074 |
| 16a | Cover for connecting block | 1 | VD503622 |

NOTE: This connecting block assembly is replaced by the new interchangeable assembly VD408074, shown on next figure.

Earth terminal assembly

Part number: VD408298 (item 17)

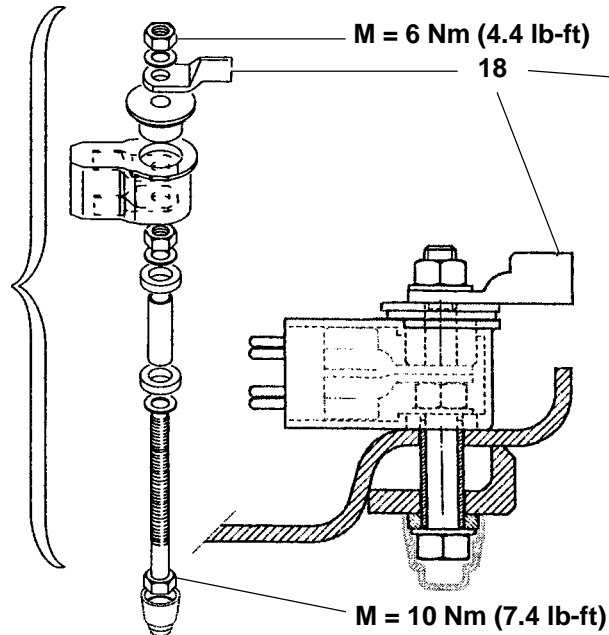
**for retarder
F90/101/130/141/151/170/191/2000/2200/2400
and all other up to serial number F130995**



M = tightening torque

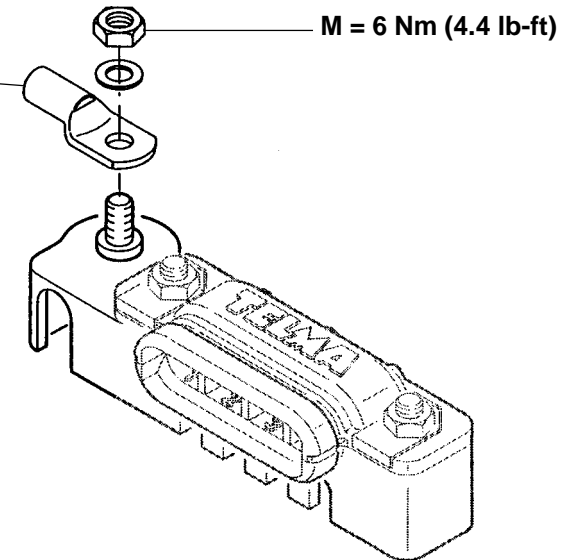
Part number: VD408046 (item 17)

**For retarder
F250/271/301/2700/3000/3300
From serial number F130996
to serial number F181463**



M = 10 Nm (7.4 lb-ft)

**For all retarder
from serial number F181464
Integrated in connecting block
VD408074**

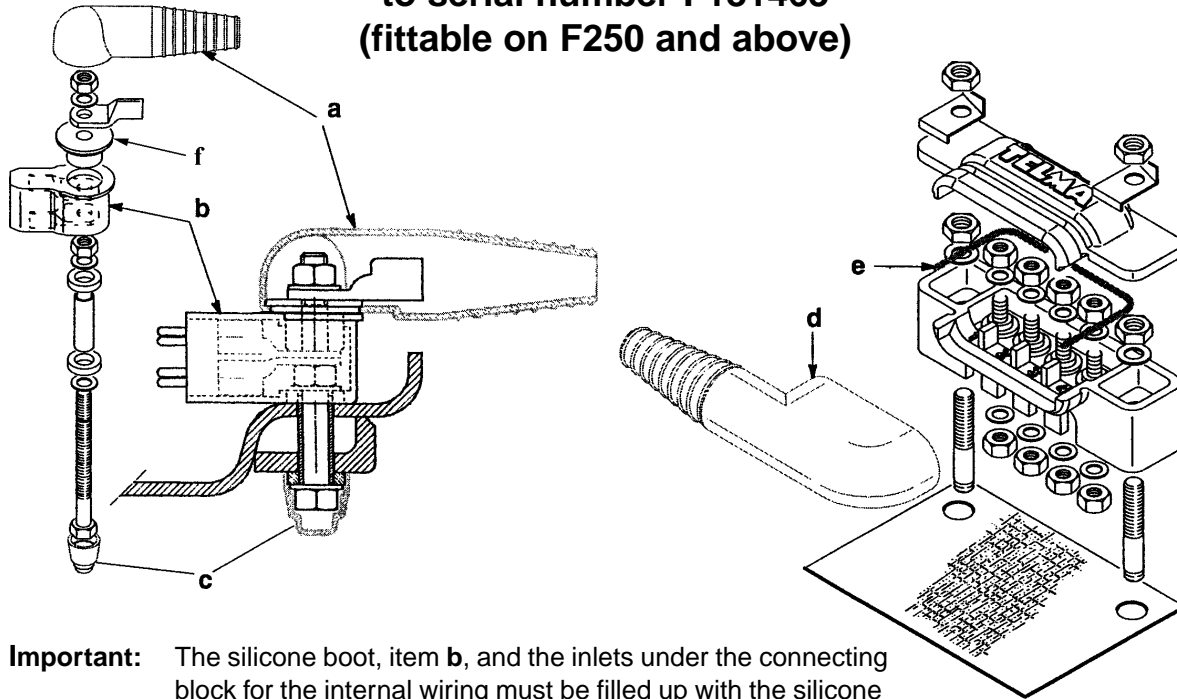


M = 6 Nm (4.4 lb-ft)

| Item | Description | Reference | 12 V Retarder | 24 V Retarder |
|------|---|-----------|--|---|
| 18 | Earth cable terminal 25 mm ² | VG510331 | | FV60-90 (F90) / FV61-00 (F101) |
| 18 | Earth cable terminal 35 mm ² | V 510332 | FV60-90 (F90) / FV61-00 (F101) | from FV61-30 (F130) to FN72-00 (F2000) |
| 18 | Earth cable terminal 50 mm ² | VG510333 | from FV61-30 (F130) to FN72-00 (F2000) | from FN72-20 (F2200) to FN83-30 (F3300) |
| 18 | Earth cable terminal 70 mm ² | VG510334 | FN72-20 (F2200) / FN72-40 (F2400) / FV82-70 (F271) | |

Sealing kit – Ref. VB107322

From serial number F130996
to serial number F181463
(fittable on F250 and above)

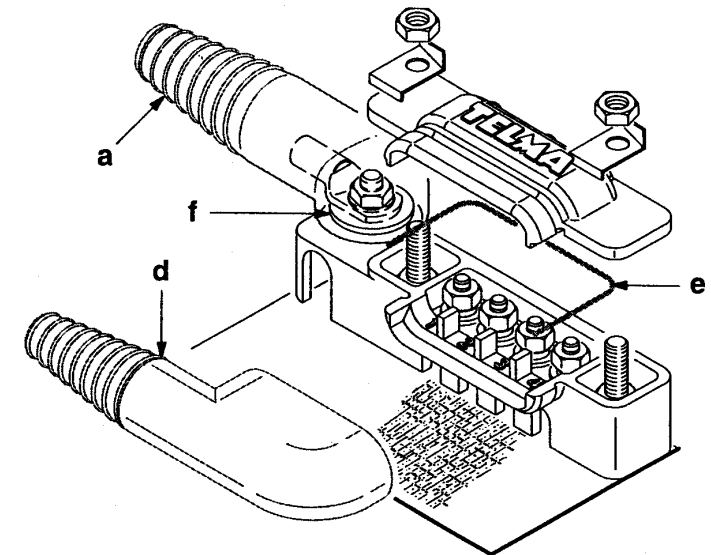


Important: The silicone boot, item **b**, and the inlets under the connecting block for the internal wiring must be filled up with the silicone compound included in this sealing kit. The items **c** and **e** must be bonded respectively to the earth screw and inside the cover of the connecting block.

| Item | Description | Qty |
|------|---|-----|
| a | Silicone boot for earth cable | 1 |
| b | Silicone boot for internal earth terminal | 1 |
| c | Silicone boot for earth screw | 1 |
| d | Silicone boot for connecting block | 1 |
| e | Silicone grommet | 1 |
| f | Stepped washer | 1 |
| / | Tube of silicone compound | 1 |

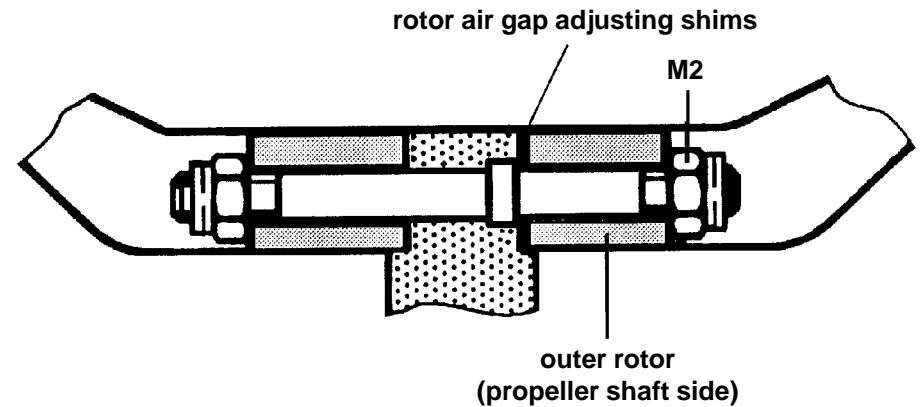
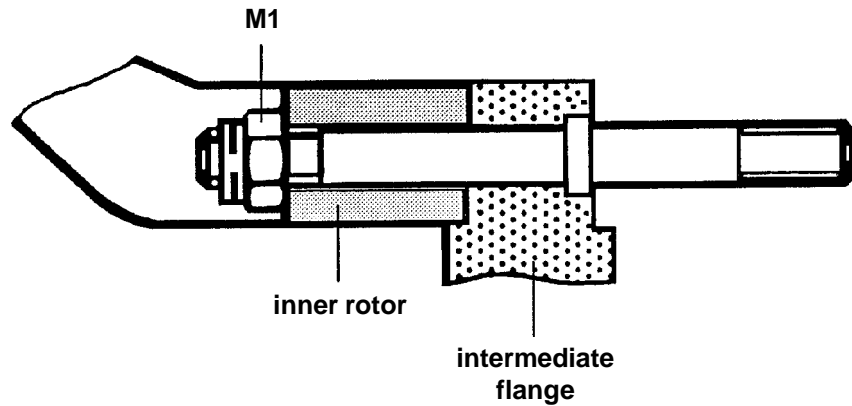
Sealing kits

From serial number F181464



| Item | Description | Sealing kit VB107556 | Sealing kit VB107377 |
|------|------------------------------------|-------------------------|-------------------------|
| | | Quantity | |
| a | Silicone boot for earth cable | 1 | / |
| d | Silicone boot for connecting block | 1 | 1 |
| e | Silicone grommet | 1 | 1 |
| f | Stepped washer | 1 | / |

Rotors securing - Layout and tightening torques

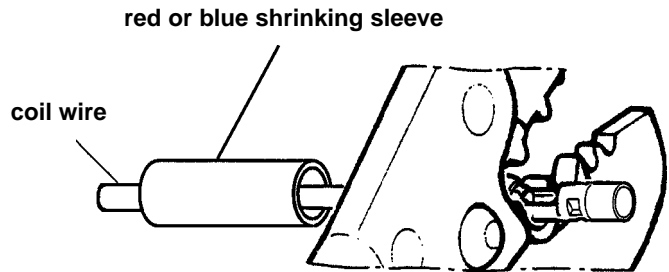
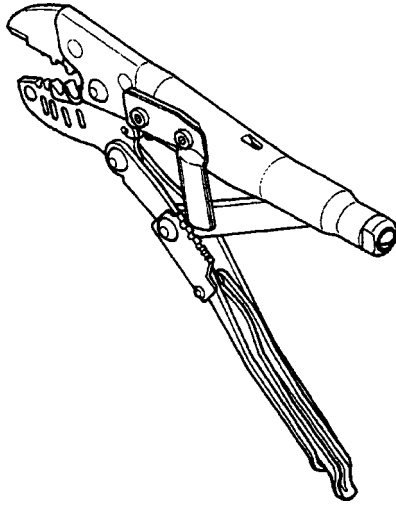


| RETARDER TYPE | | | | | | | | | ROTOR FASTENERS | | TIGHTENING TORQUES | |
|--------------------------|--------------------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|-----------------|------------|--------------------|-----------------|
| | | | | | | | | | Quantity | Dimensions | M1 (Nm / lb-ft) | M2 (Nm / lb-ft) |
| FV60-90 (F90) | FV61-00 (F101) | FV61-30 (F130) | FV61-31 | FV61-40 (F141) | | | | | 4 | M10x1 | 18 / 15 | 54 / 40 |
| FV71-50 (F151) | FV71-70 (F170) | FV71-90 (F191) | FN72-00 (F2000) | FN72-20 (F2200) | FN72-40 (F2400) | | | | 4 | M12x1.5 | 30 / 22 | 93 / 68 |
| FP82-00 (F200) | FP82-70 | | FV82-60 (F272) | FV82-70 (F271) | FV83-00 (F301) | FN82-70 (F2700) | FN83-00 (F3000) | FN83-30 (F3300) | 8 | M12x1.5 | 30 / 22 | 93 / 68 |

Crimping tool and wiring repair kit

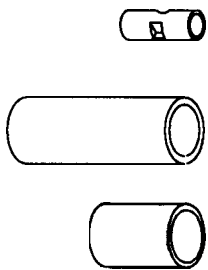
In certain cases, it is necessary to replace coil tabs.

Only genuine TELMA parts and a suitable crimping tool **RKG n° 69003** or **TELMA n° JZ800380**, should be used.



IMPORTANT: Remove the insulating varnish of the coil wires before crimping the crimp connector.

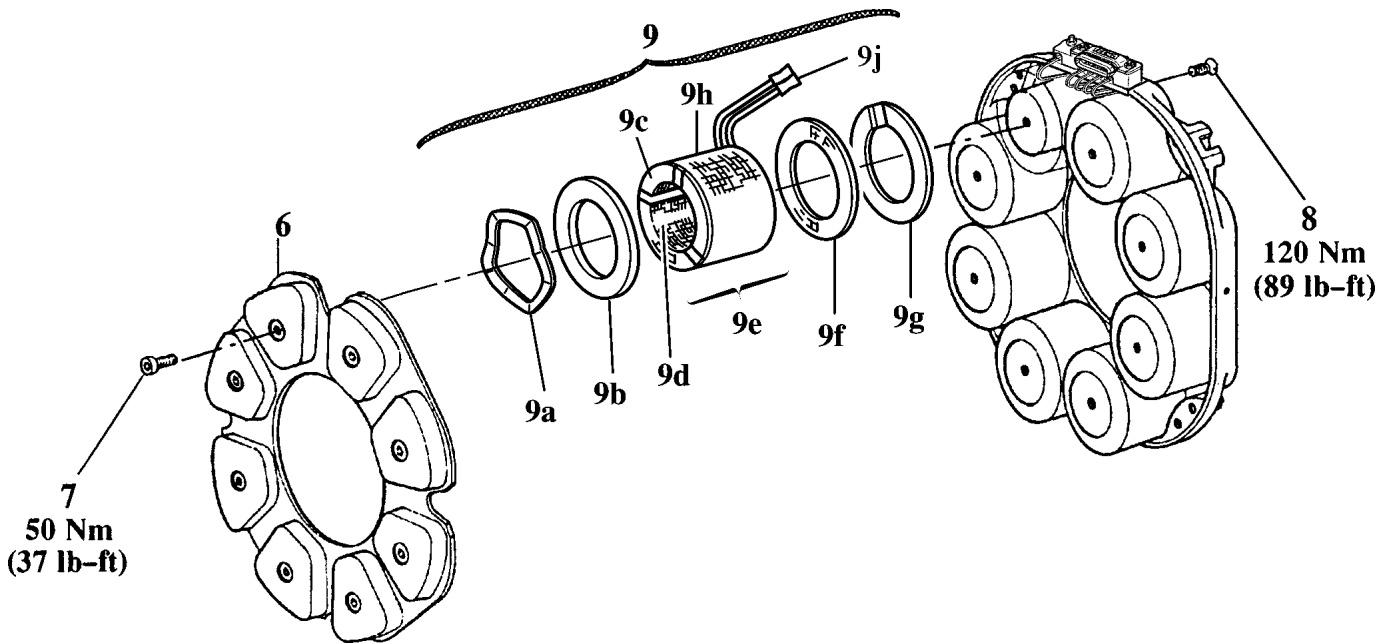
Set **VD408491** of connecting parts, including:



| Description | Qty |
|----------------------------|-----|
| crimp connector | 16 |
| Viton sleeve | 16 |
| red shrinking sleeve | 8 |

After the repair, protect the wiring with varnish (1 liter can: **VH510440**).

Replacement of a coil



1 – REMOVING OF A DAMAGED COIL

- Mark the position of the pole shoe plate (item 6) with regard to the connecting block of the stator.
- Unlock the 8 socket cap screws (item 7) and remove the pole shoe plate.

Note: • On the stators with «sealed wiring», the internal wiring is moulded in Araldite. In this case, the wires must be removed carefully in order not to damage their insulators.

This work can be made easier by softening the Araldite with a hot air appliance.

DO NOT USE A TORCH.

- On «impregnated stators», the internal wiring is hold by means of securing plates (item 21) which must be deformed for dismantling the cables.
- After having identified the coil to be replaced, remove from the stator both connecting wires and mark both of them with red and blue sleeves prior to cutting the connecting wires near the crimp connectors.
- From the pole, remove the pressure washer (item 9a), the defective coil (item 9e), the coil end insulator (item 9f) and the stainless protective washer (item 9g).
- Should be coil be locked to the pole, unlock and remove the countersunk screw (item 8) which secures the pole and the coil assembly to the stator housing. Mark the position of the pole with regard to the housing in order to refit it in its original position and remove the pole and coil assembly.
- Separate the coil from the pole by using a press.

2 – CLEANING OF THE STATOR

- Remove all traces of varnish, insulating material and Araldite which may be stuck on the pole, the pole shoe plate and the stator housing.
- Reassemble the pole on the stator in its genuine position using a new screw (item 8), tightening torque: 120 Nm (= 89 lb-ft).
- Paint protective varnish, part n° VH510440, red color, on the inner side of the stator housing.

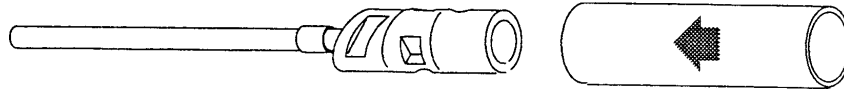
IMPORTANT :

Before bonding the coil with Araldite, make a preliminary test installation to check that the set consisting in the coil itself, the insulation washers, the protective cover and the pressure washer fit properly on the pole. The mating face for the pressure washer on the coil must be below the face of the pole in order for the pressure washer to be properly compressed by the pole shoe plate (item 6).

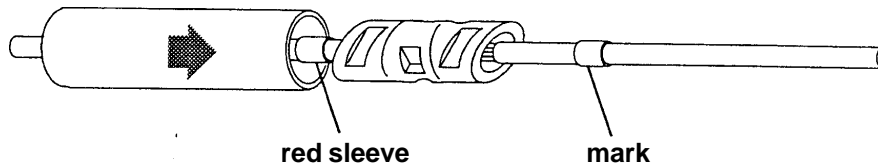
Replacement of a coil

3 – FITTING THE NEW COIL

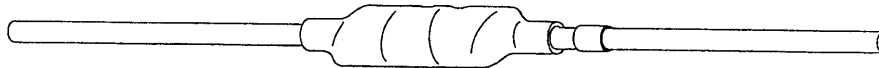
- Place on the stator housing the new protective washer (item 9g) with the notch inside the recess of the housing for the coil wire location.
- Place the coil end insulation (item 9f) above the protective washer.
- Fit the new coil (item 9e), placing the wires inside the notch of the protective washer.
- Check that there is no excessive play between the coil and the pole, otherwise the coil must be stuck by using Araldite (refer to paragraph 4).
- Slide a viton sleeve on both wires of the new coil.



- Remove 5 mm insulation from the ends of the connecting wires.
- Following the suitable internal wiring diagram and the marks made during the disassembly, install the ends of the connecting wires inside the crimp connectors of the coil and crimp the connector.



- Slide the viton sleeve over the connector and heat shrink it.



- Depending on the type of wiring protection (sealed or impregnated), bond the terminal connections with silicone compound, part n° VH510130 or clamp them with the small cable securing plates (item 21).
- Fit the stainless protective cover (item 9b) and the pressure washer (item 9a).
- Relocate the pole shoe plate (item 6) in its original position and check that all pressure washers are properly fitted against the coils.
- Secure the pole shoe plate with 8 new screws (item 7), tightening torque: 50 Nm (= 37 lb-ft).
- After tightening, check that the coils do not turn, otherwise the other pressure washers must also be replaced.
- Make the electrical checks of the stator.

4 – PREPARATION OF THE MIXTURE OF ARALDITE AND HARDENER

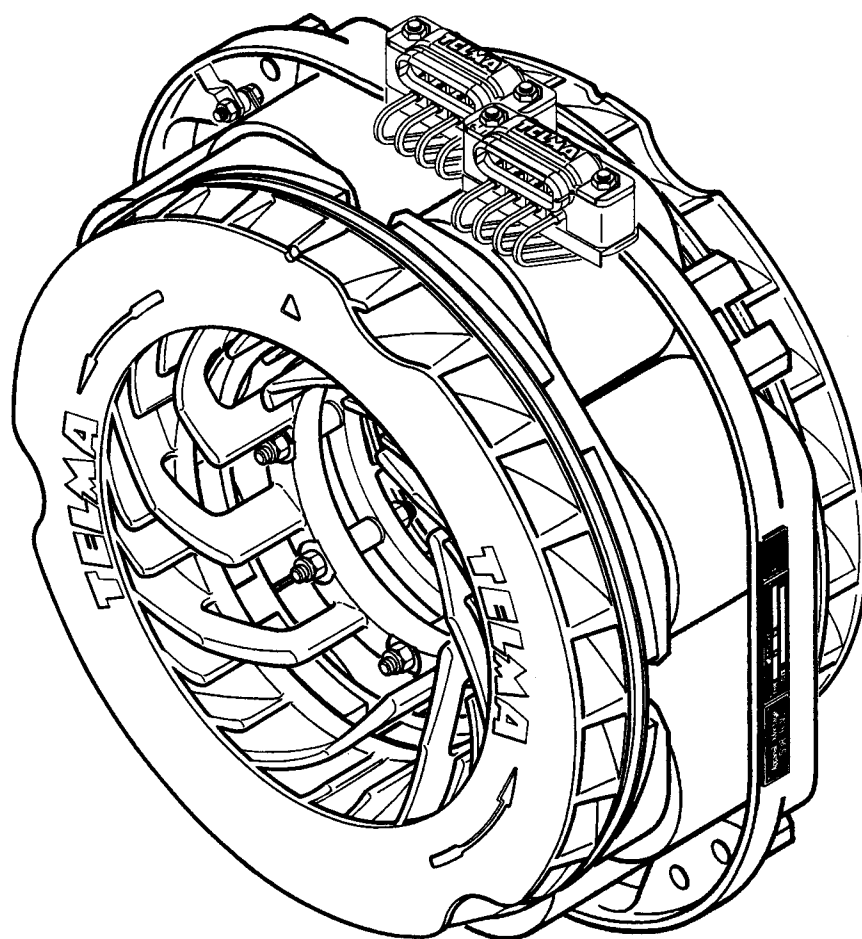
In the following text, the mixture will be designated by Araldite.

IMPORTANT : For hygiene and health reason it is recommended not to breath Araldite vapour. The contact of Araldite with the skin must also be avoided. Therefore use gloves and keep the tools and the workbench clean.

- The coils are bonded to the poles with an Araldite/hardener mixture, to be prepared with:
a 1 kg can of Araldite n° : VH510160
a 400 g can of hardener n° : VH510310
- The required quantity of mixture depends on the number of coils to be bonded. Approximately 60 grams of mixture are required per coil.
- Take a very clean metal container and just before use, mix 40 parts of hardener with 100 parts of Araldite for each coil to be bonded.

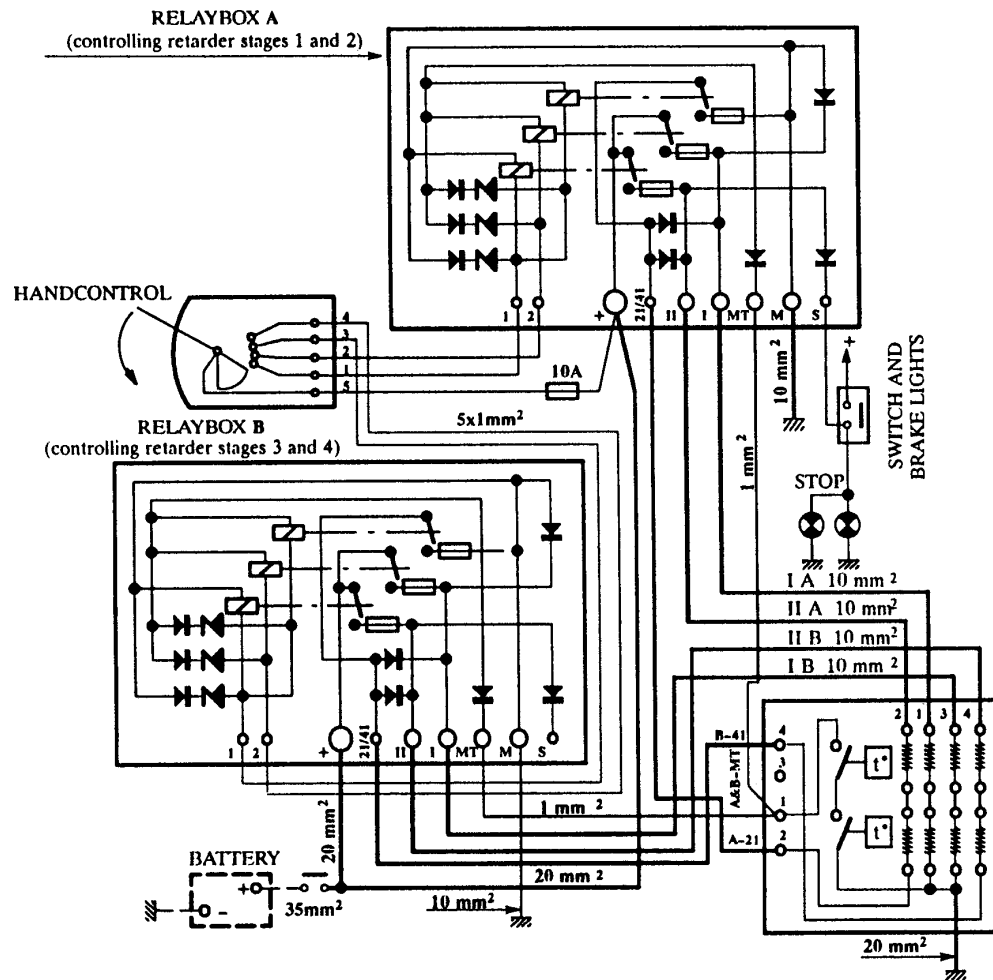
Polymerization time at ambient temperature of 20°C (68°F): approx. 12 hours.

FOCAL Retarders with thermal protection

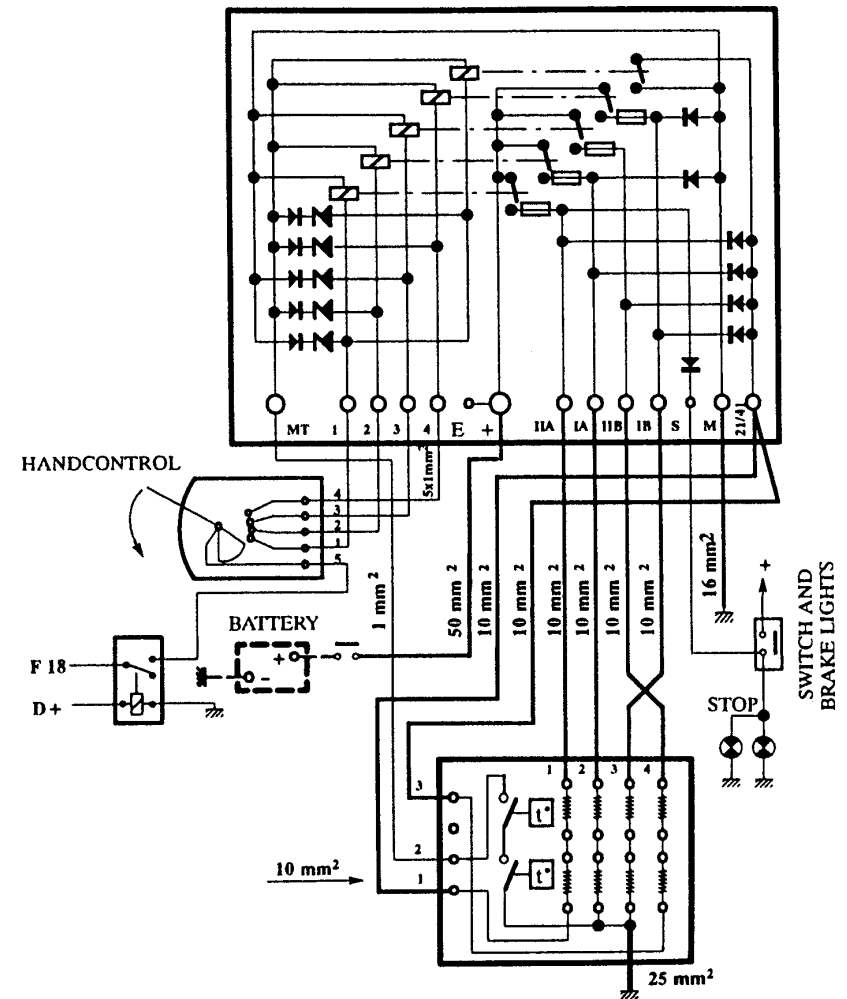


Installation wiring diagrams for FOCAL retarders with a thermal protection

Old layout with 2 relayboxes with 3 relays each
n° JD112106



Present layout with 1 relaybox with 5 relays
n° JD242110



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