

Shop Manual

HYDRAULIC
EXCAVATOR

PC360LC-10

SERIAL NUMBERS 70001 and up

KOMATSU

SHOP MANUAL

HYDRAULIC EXCAVATOR

PC360LC-10

Model Serial Number

PC360LC-10 70001 and up

00 Index and foreword

00 Index and foreword

Index

Index (ALL-0310-001-A-00-A)

00 Index and foreword	00-1
Index	00-2
Foreword, safety and general information	00-14
Important safety notice	00-14
How to read the shop manual	00-21
Explanation of terms for maintenance standard	00-23
Handling equipment of fuel system devices	00-25
Handling of intake system parts	00-26
Handling of hydraulic equipment	00-27
Method of disconnecting and connecting of push-pull type coupler	00-29
Handling of electrical equipment	00-32
How to read electric wire code	00-40
Precautions when performing operation	00-43
Practical use of KOMTRAX	00-48
Standard tightening torque table	00-49
List of abbreviation	00-55
Conversion table	00-60
01 Specification	01-1
Table of contents	01-2
Specifications	01-3
Specification drawing	01-3
Working range drawings	01-4
Specifications	01-5
Weight table	01-8
Table of fuel, coolant and lubricants	01-10
10 Structure and function	10-1
Table of contents	10-2
Engine and cooling system	10-3
Engine related parts	10-3
KVTG	10-5
EGR system piping drawing	10-12
EGR system circuit diagram	10-14
EGR valve	10-16
EGR cooler	10-18
KCCV layout drawing	10-19
KCCV ventilator	10-22
KDPF	10-24
Cooling system	10-28
Power train	10-30
Power train	10-30
Swing circle	10-31
Swing machinery	10-32
Final drive	10-34
Undercarriage and frame	10-36
Track frame and idler cushion	10-36
Hydraulic system	10-38
Hydraulic component layout	10-38
Valve control	10-40
Hydraulic tank	10-42
CLSS	10-44
Main pump	10-49
Control valve	10-74
Swing motor	10-130
Travel motor	10-141
PPC valve	10-156
Solenoid valve	10-177
Attachment circuit selector valve	10-181

Center swivel joint	10-184
Accumulator	10-186
Work equipment	10-187
Work equipment.....	10-187
Cab and its attachments	10-190
Cab mount and cab tipping stopper	10-190
ROPS cab	10-191
Electrical system	10-192
Electrical control system	10-192
Machine monitor system.....	10-240
KOMTRAX system.....	10-259
Sensor	10-262
20 Standard value tables.....	20-1
Table of contents	20-2
Standard service value table.....	20-3
Standard value table for engine related parts	20-3
Standard value table for machine	20-5
30 Testing and adjusting	30-1
Table of contents	30-2
Related information on testing and adjusting	30-3
Tools for testing and adjusting	30-3
Sketch of tools for testing and adjusting	30-7
Engine and cooling system.....	30-9
Testing engine speed	30-9
Testing boost pressure	30-10
Testing exhaust gas color	30-13
Testing and adjusting valve clearance	30-15
Testing compression pressure.....	30-19
Testing blowby pressure	30-27
Testing engine oil pressure	30-29
Testing EGR valve and KVGT oil pressures	30-30
Testing fuel pressure	30-31
Testing fuel discharge, return and leakage.....	30-38
Bleeding air from fuel system	30-44
Testing fuel circuit for leakage	30-45
Handling cylinder cutout mode operation.....	30-46
Handling no-injection cranking operation.....	30-47
Checking and adjusting air conditioner compressor belt tension	30-48
Replacing fan belt	30-49
Replacing alternator belt	30-50
Power train.....	30-51
Testing swing circle bearing clearance	30-51
Undercarriage and frame.....	30-52
Testing and adjusting track tension	30-52
Hydraulic system	30-53
Releasing remaining pressure from hydraulic circuit.....	30-53
Testing and adjusting oil pressure in work equipment, swing, and travel circuits.....	30-54
Testing oil pressure of control circuit	30-60
Testing and adjusting oil pressure in pump PC control circuit.....	30-62
Testing and adjusting oil pressure in pump LS control circuit	30-67
Testing outlet pressure of solenoid valve	30-76
Testing PPC valve output pressure	30-80
Adjusting play of work equipment and swing PPC valves.....	30-82
Testing pump swash plate sensor	30-83
Isolating the parts causing hydraulic drift in work equipment.....	30-84
Testing oil leakage	30-86
Bleeding air from hydraulic circuit	30-88
Cab and its attachments.....	30-91
Checking cab tipping stopper	30-91

Adjusting mirrors	30-92
Electrical system	30-95
Special functions of machine monitor	30-95
Adjusting rearview camera angle	30-161
Handling voltage circuit of engine controller	30-163
Handling battery disconnect switch	30-164
Testing diodes	30-165
Pm clinic	30-166
Pm clinic service	30-166
40 Troubleshooting	40-1
Table of contents	40-2
Related information on troubleshooting	40-9
Troubleshooting points	40-9
Sequence of events in troubleshooting	40-11
Checks before troubleshooting	40-13
Inspection procedure before troubleshooting	40-15
Preparation work for troubleshooting of electrical system	40-34
Classification and procedure for troubleshooting	40-41
Symptom and troubleshooting numbers	40-44
Information in troubleshooting table	40-47
Troubleshooting method for open circuit in wiring harness of pressure sensor system	40-49
Connector list and layout	40-51
Connector contact identification	40-62
T-branch box and T-branch adapter table	40-100
Fuse location table	40-105
Preparation of dummy temperature sensor (for KDOC and KDPF temperature sensors)	40-107
Preparation of short circuit electrical connector (for failure codes [CA1883] and [CA3135])	40-108
Precautions for KDPF (KCSF and KDOC) Cleaning and Replacement	40-109
Failure codes table	40-112
Troubleshooting by failure code (Display of code)	40-121
Failure code [879AKA] A/C Inner Sensor Open Circuit	40-121
Failure code [879AKB] A/C Inner Sensor Short Circuit	40-122
Failure code [879BKA] A/C Outer Sensor Open Circuit	40-123
Failure code [879BKB] A/C Outer Sensor Short Circuit	40-124
Failure code [879CKA] Ventilating Sensor Open Circuit	40-125
Failure code [879CKB] Ventilating Sensor Short Circuit	40-126
Failure code [879DKZ] Sunlight Sensor Open Or Short Circuit	40-127
Failure code [879EMC] Ventilation Damper Abnormality	40-128
Failure code [879FMC] Air Mix Damper Abnormality	40-129
Failure code [879GKX] Refrigerant Abnormality	40-130
Failure code [989L00] Engine Controller Lock Caution 1	40-131
Failure code [989M00] Engine Controller Lock Caution 2	40-132
Failure code [989N00] Engine Controller Lock Caution 3	40-133
Failure code [A1U0N3] HC Desorb Request 1	40-134
Failure code [A1U0N4] HC Desorb Request 2	40-136
Failure code [AA10NX] Air Cleaner Clogging	40-138
Failure code [AB00KE] Charge Voltage Low	40-140
Failure code [B@BAZG] Eng Oil Press Low	40-142
Failure code [B@BAZK] Eng Oil Level Low	40-143
Failure code [B@BCNS] Eng Water Overheat	40-144
Failure code [B@BCZK] Eng Water Level Low	40-145
Failure code [B@HANS] Hyd Oil Overheat	40-147
Failure code [CA115] Eng Ne and Bkup Speed Sens Error	40-148
Failure code [CA122] Chg Air Press Sensor High Error	40-149
Failure code [CA123] Chg Air Press Sensor Low Error	40-151
Failure code [CA131] Throttle Sensor High Error	40-153
Failure code [CA132] Throttle Sensor Low Error	40-155

Failure code [CA144] Coolant Temp Sens High Error	40-157
Failure code [CA145] Coolant Temp Sens Low Error	40-159
Failure code [CA153] Chg Air Temp Sensor High Error	40-161
Failure code [CA154] Chg Air Temp Sensor Low Error	40-163
Failure code [CA187] Sensor 2 Supply Volt Low Error	40-165
Failure code [CA221] Ambient Press Sensor High Error	40-167
Failure code [CA222] Ambient Press Sensor Low Error	40-169
Failure code [CA227] Sensor 2 Supply Volt High Error	40-171
Failure code [CA234] Eng Overspeed	40-172
Failure code [CA238] Ne Speed Sensor Supply Volt Error	40-173
Failure code [CA239] Ne Speed Sens Supply Volt High Error	40-174
Failure code [CA271] IMV/PCV1 Short Error	40-175
Failure code [CA272] IMV/PCV1 Open Error	40-177
Failure code [CA281] Pump Press Balance Error	40-179
Failure code [CA295] Ambient Pressure Sensor In Range Error	40-180
Failure code [CA322] Inj #1(L#1) Open/Short Error	40-181
Failure code [CA323] Inj #5(L#5) Open/Short Error	40-183
Failure code [CA324] Inj #3(L#3) Open/Short Error	40-185
Failure code [CA325] Inj #6(L#6) Open/Short Error	40-187
Failure code [CA331] Inj #2(L#2) Open/Short Error	40-189
Failure code [CA332] Inj #4(L#4) Open/Short Error	40-191
Failure code [CA343] ECM Critical Internal Failure	40-193
Failure code [CA351] Injectors Drive Circuit Error	40-194
Failure code [CA352] Sensor 1 Supply Volt Low Error	40-195
Failure code [CA356] Mass Air Flow Sensor High Error	40-197
Failure code [CA357] Mass Air Flow Sensor Low Error	40-199
Failure code [CA386] Sensor 1 Supply Volt High Error	40-201
Failure code [CA428] Water in Fuel Sensor High Error	40-202
Failure code [CA429] Water in Fuel Sensor Low Error	40-204
Failure code [CA435] Eng Oil Press Sw Error	40-206
Failure code [CA441] Battery Voltage Low Error	40-207
Failure code [CA442] Battery Voltage High Error	40-209
Failure code [CA449] Rail Press Very High Error	40-210
Failure code [CA451] Rail Press Sensor High Error	40-212
Failure code [CA452] Rail Press Sensor Low Error	40-214
Failure code [CA488] Chg Air Temp High Torque Derate	40-216
Failure code [CA515] Rail Press Sens Sup Volt High Error	40-217
Failure code [CA516] Rail Press Sens Sup Volt Low Error	40-219
Failure code [CA553] Rail Press High Error	40-221
Failure code [CA555] Crankcase Press High Error 2	40-222
Failure code [CA556] Crankcase Press High Error 2	40-223
Failure code [CA559] Rail Pump Press Low Error	40-224
Failure code [CA595] Turbo Speed High Error 2	40-228
Failure code [CA687] Turbo Speed Low Error	40-229
Failure code [CA689] Eng Ne Speed Sensor Error	40-231
Failure code [CA691] Intake Air Temp Sens High Error	40-235
Failure code [CA692] Intake Air Temp Sens Low Error	40-237
Failure code [CA697] ECM Internal Temp Sensor High Error	40-239
Failure code [CA698] ECM Int Temp Sensor Low Error	40-240
Failure code [CA731] Eng Bkup Speed Sens Phase Error	40-241
Failure code [CA778] Eng Bkup Speed Sensor Error	40-243
Failure code [CA1117] Persistent Data Lost Error	40-248
Failure code [CA1664] KDOC Malfunction	40-249
Failure code [CA1691] Regeneration Ineffective	40-251
Failure code [CA1695] Sens 5 Supply Volt High Error	40-254
Failure code [CA1696] Sens 5 Supply Volt Low Error	40-255
Failure code [CA1843] Crankcase Press Sens High Error	40-257
Failure code [CA1844] Crankcase Press Sens Low Error	40-259
Failure code [CA1879] KDPF Delta P Sensor High Error	40-261

Failure code [CA1881] KDPF Delta P Sensor Low Error	40-263
Failure code [CA1883] KDPF Delta P Sens In Range Error	40-265
Failure code [CA1921] KDPF Soot Load High Error 1	40-268
Failure code [CA1922] KDPF Soot Load High Error 2	40-271
Failure code [CA1942] Crankcase Press Sens In Range Error	40-276
Failure code [CA1993] KDPF Delta Pressure Low Error	40-277
Failure code [CA2185] Throt Sens Sup Volt High Error	40-280
Failure code [CA2186] Throt Sens Sup Volt Low Error	40-282
Failure code [CA2249] Rail Press Very Low Error	40-284
Failure code [CA2265] Fuel Feed Pump Open Error	40-285
Failure code [CA2266] Fuel Feed Pump Short Error	40-287
Failure code [CA2271] EGR Valve Pos Sens High Error	40-289
Failure code [CA2272] EGR Valve Pos Sens Low Error	40-291
Failure code [CA2288] Turbo Speed High Error 1	40-294
Failure code [CA2311] IMV Solenoid Error	40-295
Failure code [CA2349] EGR Valve Solenoid Open Error	40-296
Failure code [CA2353] EGR Valve Solenoid Short Error	40-298
Failure code [CA2357] EGR Valve Servo Error	40-300
Failure code [CA2373] Exhaust Manifold Press Sens High error	40-301
Failure code [CA2374] Exhaust Manifold Press Sens Low error	40-303
Failure code [CA2375] EGR Orifice Temp Sens High Error	40-305
Failure code [CA2376] EGR Orifice Temp Sens Low Error	40-307
Failure code [CA2381] KVGTT Pos Sens High Error	40-309
Failure code [CA2382] KVGTT Pos Sens Low Error	40-311
Failure code [CA2383] KVGTT Solenoid Open Error	40-314
Failure code [CA2386] KVGTT Solenoid Short Error	40-316
Failure code [CA2387] KVGTT Servo Error	40-318
Failure code [CA2554] Exh Manifold Press Sens In Range Error	40-319
Failure code [CA2555] Grid Htr Relay Open Circuit Error	40-320
Failure code [CA2556] Grid Htr Relay Short Circuit Error	40-322
Failure code [CA2637] KDOC Face Plugging	40-324
Failure code [CA2639] Manual Stationary Regeneration Request	40-326
Failure code [CA2961] EGR Orifice Temp High Error 1	40-329
Failure code [CA2973] Chg Air Press Sensor In Range Error	40-330
Failure code [CA3133] KDPF Outlet Press Sens High Error	40-331
Failure code [CA3134] KDPF Outlet Press Sens Low Error	40-333
Failure code [CA3135] KDPF Outlet Press Sens In Range Error	40-335
Failure code [CA3251] KDOC Inlet Temp High Error	40-339
Failure code [CA3253] KDOC Temp Error - Non Regeneration	40-342
Failure code [CA3254] KDOC Outlet Temp High Error 1	40-345
Failure code [CA3255] KDPF Temp Error - Non Regeneration	40-348
Failure code [CA3256] KDPF Outlet Temp High Error 1	40-351
Failure code [CA3311] KDOC Outlet Temp High Error 2	40-354
Failure code [CA3312] KDPF Outlet Temp High Error 2	40-357
Failure code [CA3313] KDOC Inlet Temp Sensor Low Error	40-360
Failure code [CA3314] KDOC Inlet Temp Sens High Error	40-363
Failure code [CA3315] KDOC Inlet Temp Sens In Range Error	40-367
Failure code [CA3316] KDOC Outlet Temp Sens Low Error	40-371
Failure code [CA3317] KDOC Outlet Temp Sens High Error	40-374
Failure code [CA3318] KDOC Outlet Temp Sens In Range Error	40-378
Failure code [CA3319] KDPF Outlet Temp Sens High Error	40-382
Failure code [CA3321] KDPF Outlet Temp Sens Low Error	40-386
Failure code [CA3322] KDPF Outlet Temp Sens In Range Error	40-389
Failure code [CA3419] Mass Air Flow Sensor Sup Volt High Error	40-393
Failure code [CA3421] Mass Air Flow Sensor Sup Volt Low Error	40-395
Failure code [CA3741] Rail Press Valve Trip Error	40-397
Failure code [D110KB] Battery Relay Drive S/C	40-398
Failure code [D19JKZ] Personal Code Relay Abnormality	40-400
Failure code [D811MC] KOMTRAX Error	40-403

Failure code [D862KA] GPS Antenna Open Circuit	40-404
Failure code [D8ALKA] System Operating Lamp Disconnection (KOMTRAX).....	40-405
Failure code [D8ALKB] System Operating Lamp Short Circuit (KOMTRAX)	40-407
Failure code [D8AQKR] CAN2 Discon (KOMTRAX)	40-408
Failure code [DA20MC] Pump Controller Malfunction	40-409
Failure code [DA22KK] Pump Solenoid Power Low Error.....	40-410
Failure code [DA25KP] 5V Sensor1 Power Abnormality	40-412
Failure code [DA29KQ] Model Selection Abnormality	40-415
Failure code [DA2LKA] System Operating Lamp Disconnection (Pump Con)	40-417
Failure code [DA2LKB] System Operating Lamp Short Circuit (Pump Con)	40-419
Failure code [DA2QKR] CAN2 Discon (Pump Con)	40-420
Failure code [DA2RKR] CAN1 Discon (Pump Con)	40-423
Failure code [DAF0MB] Monitor ROM Abnormality.....	40-424
Failure code [DAF0MC] Monitor Error	40-425
Failure code [DAF8KB] Camera Power Supply Short Circuit	40-426
Failure code [DAF9KQ] Model Selection Abnormality	40-428
Failure code [DAFGMC] GPS Module Error.....	40-429
Failure code [DAFLKA] Operating Lamp Open Circuit(Monitor)	40-430
Failure code [DAFLKB] System Operating Lamp Short Circuit (Monitor).....	40-432
Failure code [DAFQKR] CAN2 Discon (Monitor)	40-433
Failure code [DAZ9KQ] AC Model Selection Abnormality	40-434
Failure code [DAZQKR] CAN2 Discon (AC).....	40-435
Failure code [DB2QKR] CAN2 Discon (Engine Con)	40-440
Failure code [DB2RKR] CAN1 Discon (Engine Con)	40-445
Failure code [DGH2KB] Hyd Oil Sensor Short Circuit	40-449
Failure code [DHA4KA] Air Cleaner Clogging Sensor Open Circuit.....	40-451
Failure code [DHPAMA] Pump Press Sensor Abnormality	40-453
Failure code [DHPBMA] R Pump Press Sensor Abnormality	40-456
Failure code [DHS3MA] Arm IN PPC Sen. Abnormality	40-459
Failure code [DHS4MA] Bucket CURL PPC Press Sensor Abnormality	40-461
Failure code [DHS8MA] Boom RAISE PPC Press Sensor Abnormality	40-464
Failure code [DHS9MA] Boom LOWER Press Sensor Abnormality.....	40-467
Failure code [DHSAMA] Swing RH PPC Press Sensor Abnormality.....	40-470
Failure code [DHSBMA] Swing LH PPC Press Sensor Abnormality	40-473
Failure code [DHSCMA] Arm OUT PPC Press Sensor Abnormality	40-476
Failure code [DHSDMA] Bucket Dump PPC Press Sensor Abnormality	40-479
Failure code [DHSFMA] Travel FW L PPC Press Sensor Abnormality.....	40-482
Failure code [DHSGMA] Travel FW R PPC Press Sensor Abnormality	40-485
Failure code [DHSHMA] Travel BW L PPC Press Sensor Abnormality	40-488
Failure code [DHSJMA] Travel BW R PPC Press Sensor Abnormality	40-491
Failure code [DKR0MA] F pump S/P sensor Abnormality.....	40-494
Failure code [DKR1MA] R pump S/P sensor Abnormality	40-496
Failure code [DR21KX] Camera 2 Picture Rev. Drive Abnormality	40-498
Failure code [DR31KX] Camera 3 Picture Rev. Drive Abnormality	40-500
Failure code [DV20KB] Travel Alarm Short Circuit.....	40-502
Failure code [DW43KA] Travel Speed Sol Open Circuit	40-504
Failure code [DW43KB] Travel Speed Sol Short Circuit	40-506
Failure code [DW45KA] swing holding brake Sol Open Circuit	40-508
Failure code [DW45KB] Swing Brake Sol Short Circuit	40-511
Failure code [DW91KA] Travel Junction Sol Open Circuit	40-514
Failure code [DW91KB] Travel Junction Sol Short Circuit.....	40-516
Failure code [DWA2KA] Attachment Sol Open Circuit.....	40-518
Failure code [DWA2KB] Attachment Sol Short Circuit.....	40-520
Failure code [DWK0KA] 2-stage Relief Sol Open Circuit.....	40-522
Failure code [DWK0KB] 2-stage Relief Sol Short Circuit	40-524
Failure code [DWK2KA] Variable Back Pressure Sol Open Circuit	40-526
Failure code [DWK2KB] Variable Back Pressure Sol Short Circuit	40-528
Failure code [DWK8KA] Swing C/O Solenoid Open Circuit	40-530
Failure code [DWK8KB] Swing C/O Solenoid Short Circuit.....	40-532

Failure code [DXA8KA] PC-EPC (F) Sol Open Circuit.....	40-534
Failure code [DXA8KB] PC-EPC (F) Sol Short Circuit.....	40-536
Failure code [DXA9KA] PC-EPC (R) Sol Open Circuit.....	40-538
Failure code [DXA9KB] PC-EPC (R) Sol Short Circuit.....	40-540
Failure code [DXE0KA] LS-EPC Sol Open Circuit.....	40-542
Failure code [DXE0KB] LS-EPC Sol Short Circuit.....	40-544
Failure code [DXE4KA] Service Current EPC Disc.....	40-546
Failure code [DXE4KB] Service Current EPC S/C.....	40-547
Failure code [DXE5KA] Merge-divider Main Sol Open Circuit.....	40-548
Failure code [DXE5KB] Merge-divider Main Sol Short Circuit.....	40-550
Failure code [DXE6KA] Merge-divider LS Sol Open Circuit.....	40-552
Failure code [DXE6KB] Merge-divider LS Sol Short Circuit.....	40-554
Failure code [DY20KA] Wiper Working Abnormality.....	40-556
Failure code [DY20MA] Wiper Parking Abnormality.....	40-558
Failure code [DY2CKB] Washer Drive Short Circuit.....	40-560
Failure code [DY2DKB] Wiper Drive (For) Short.....	40-562
Failure code [DY2EKB] Wiper Drive (Rev) Short.....	40-564
Troubleshooting of electrical system (E-mode).....	40-566
E-1 Engine does not start (Engine does not crank).....	40-566
E-2 Manual preheating does not work.....	40-572
E-3 Automatic preheating system does not work.....	40-575
E-4 While preheating is working, preheating monitor does not light up.....	40-577
E-5 When starting switch is turned to ON position, machine monitor displays nothing.....	40-579
E-6 While starting switch is turned to ON position (with engine stopped), engine oil level monitor lights up in yellow.....	40-582
E-7 While starting switch is turned to ON position (with engine stopped), radiator coolant level monitor lights up in yellow.....	40-583
E-8 Engine coolant temperature monitor lights up in white while engine is running.....	40-584
E-9 Hydraulic oil temperature monitor lights up in white while engine is running.....	40-585
E-10 Charge level monitor lights up in red while engine is running.....	40-586
E-11 Fuel level monitor lights up in red while engine is running.....	40-587
E-12 Air cleaner clogging monitor lights up in yellow while engine is running.....	40-588
E-13 Engine coolant temperature monitor lights up in red while engine is running.....	40-589
E-14 Hydraulic oil temperature monitor lights up in red while engine is running.....	40-590
E-15 Engine oil pressure monitor lights up in red while engine is running.....	40-591
E-16 Fuel gauge display does not move from minimum or maximum.....	40-592
E-17 Display of fuel gauge differs from actual fuel level.....	40-593
E-18 Engine coolant temperature gauge display does not move from minimum or maximum.....	40-594
E-19 Display of engine coolant temperature gauge differs from actual coolant temperature.....	40-595
E-20 Hydraulic oil temperature gauge display does not move from minimum or maximum.....	40-596
E-21 Display of hydraulic oil temperature gauge differs from actual oil temperature.....	40-598
E-22 Machine monitor does not display partially.....	40-599
E-23 Function switch does not operate.....	40-600
E-24 Automatic warm-up system does not work (in cold weather).....	40-601
E-25 When auto-decelerator switch is operated, auto-decelerator monitor does not light up or does not go off.....	40-602
E-26 Auto-decelerator is not operated or canceled with lever.....	40-603
E-27 When working mode switch is operated, working mode selection screen is not displayed.....	40-604
E-28 When working mode is changed, setting of engine and hydraulic pump is not changed.....	40-605
E-29 When travel speed switch is operated, travel speed monitor does not change.....	40-606
E-30 When travel speed selection is changed, actual travel speed does not change.....	40-607
E-31 Alarm buzzer cannot be canceled.....	40-608
E-32 When starting switch is turned OFF, service meter is not displayed.....	40-609
E-33 Machine monitor cannot be set in service mode.....	40-610

E-34 Any of work equipment, swing and travel does not work.....	40-611
E-35 Any of work equipment, swing and travel cannot be locked	40-613
E-36 Upper structure does not swing while swing brake cancel switch is set to CANCEL position	40-615
E-37 Swing brake does not operate while swing brake cancel switch is set to NORMAL position	40-617
E-38 One-touch power maximizing function does not work properly or pilot monitor is not displayed	40-619
E-39 One-touch power maximizing function cannot be canceled	40-621
E-40 Alarm does not sound during travel	40-622
E-41 Alarm does not stop sounding while machine is stopped	40-624
E-42 Horn does not sound	40-625
E-43 Horn does not stop sounding	40-627
E-44 When wiper switch is operated, wiper monitor does not light up or go off	40-628
E-45 Wiper does not operate when wiper switch is operated	40-629
E-46 When window washer switch is operated, window washer does not operate	40-631
E-47 Boom LOWER indicator is not displayed properly with monitoring function	40-632
E-48 Arm OUT indicator is not displayed properly with monitoring function	40-633
E-49 Arm IN indicator is not displayed properly with monitoring function	40-634
E-50 Boom RAISE indicator is not displayed properly with monitoring function	40-635
E-51 Bucket CURL indicator is not displayed properly with monitoring function	40-636
E-52 Bucket DUMP indicator is not displayed properly with monitoring function	40-637
E-53 Swing indication is not displayed properly with monitoring function	40-638
E-54 Travel indication is not displayed properly with monitoring function	40-639
E-55 Service indication is not displayed properly with monitoring function	40-640
E-56 Attachment circuit is not switched	40-642
E-57 KOMTRAX system does not operate properly	40-643
E-58 Machine push-up function is not canceled	40-644
E-59 Machine push-up function does not work	40-646
Troubleshooting of hydraulic and mechanical system (H-mode)	40-647
Information described in troubleshooting table (H-mode)	40-647
List of Failure Mode and Cause	40-648
H-1 All of work equipment, swing and travel operation lacks speed or power	40-653
H-2 Engine speed lowers significantly or engine stalls	40-657
H-3 Any of work equipment, swing and travel does not work	40-660
H-4 Unusual sound is heard from around hydraulic pump	40-661
H-5 Fine control performance or response is poor	40-662
H-6 Speed or power of boom is low	40-664
H-7 Speed or power of arm is low	40-668
H-8 Speed or power of bucket is low	40-673
H-9 Work equipment does not move in single operation	40-677
H-10 Hydraulic drift of boom is large	40-678
H-11 Hydraulic drift of arm is large	40-679
H-12 Hydraulic drift of bucket is large	40-681
H-13 Time lag of work equipment is large	40-682
H-14 When part of work equipment is relieved singly, other parts of work equipment move	40-684
H-15 One-touch power maximizing function does not work	40-685
H-16 Machine push up function does not work	40-686
H-17 In combined operation of work equipment, equipment having heavier load moves slower	40-687
H-18 In combined operations of swing and boom RAISE, boom rising speed is low	40-688
H-19 In combined operations of swing and travel, travel speed drops largely	40-689
H-20 Machine does not travel straight	40-690
H-21 Travel speed is too low	40-693
H-22 Machine is hard to steer or travel power is low	40-695
H-23 Travel speed does not change, or travel speed is too low or high	40-698
H-24 One of tracks does not run	40-699
H-25 Upper structure does not swing in both right and left directions	40-701

H-26 Upper structure does not swing in only one direction	40-702
H-27 Swing acceleration or swing speed is low in both directions (right and left)	40-703
H-28 Swing acceleration performance is poor or swing speed is slow in only one direction	40-704
H-29 Upper structure overruns remarkably when it stops swinging in both directions (right and left)	40-705
H-30 Upper structure overruns excessively when it stops swinging in only one direction	40-706
H-31 Shock is large when upper structure stops swinging	40-707
H-32 Large unusual noise is heard when upper structure stops swinging	40-708
H-33 When swing holding brake is applied, hydraulic drift of swing is large	40-709
H-34 When swing holding brake is released, hydraulic drift of swing is large	40-710
H-35 When additional attachment is installed, attachment circuit is not switched	40-711
H-36 Oil flow in attachment circuit cannot be controlled	40-712
Troubleshooting of engine (S-mode)	40-713
Information contained in troubleshooting table (S mode)	40-713
S-1 Engine does not crank when starting switch is turned to START position	40-714
S-2 The engine cranks but exhaust smoke does not come out	40-715
S-3 Fuel is being injected but engine does not start (incomplete combustion: engine cranks but does not start)	40-716
S-4 Startability is poor	40-717
S-5 Engine does not pick up smoothly	40-719
S-6 Engine stops during operation	40-721
S-7 Engine runs rough or is unstable	40-723
S-8 Engine lacks power	40-724
S-9 KDPF gets clogged in a short time	40-726
S-10 Engine oil consumption is excessive	40-728
S-11 Engine oil becomes contaminated early	40-729
S-12 Fuel consumption is excessive	40-730
S-13 Oil is in coolant (or coolant spurts or coolant level goes down)	40-731
S-14 Oil pressure drops	40-732
S-15 Fuel mixes into engine oil	40-733
S-16 Water mixes into engine oil (milky)	40-734
S-17 Coolant temperature rises too high (overheating)	40-735
S-18 Unusual noise is heard	40-736
S-19 Vibration is excessive	40-737
S-20 Air cannot be bled from fuel circuit	40-738
S-21 Frequent active regeneration	40-739
S-22 Active regeneration takes time	40-740
S-23 White smoke is exhausted during active regeneration	40-741
50 Disassembly and assembly	50-1
Table of contents	50-2
Related information on disassembly and assembly	50-4
How to read this manual	50-4
Coating materials list	50-6
Special tools list	50-10
Sketches of special tools	50-15
Engine and cooling system	50-18
Removal and installation of supply pump assembly	50-18
Removal and installation of injector assembly	50-28
Removal and installation of cylinder head assembly	50-44
Removal and installation of radiator assembly	50-66
Removal and installation of hydraulic oil cooler assembly	50-69
Removal and installation of aftercooler assembly	50-72
Removal and installation of engine and main pump assembly	50-73
Removal and installation of engine front seal	50-85
Removal and installation of engine rear seal	50-90
Removal and installation of fuel tank assembly	50-97
Removal and installation of engine hood assembly	50-99

Removal and installation of KDPF assembly.....	50-102
Disassembly and assembly of KDPF	50-109
Removal and installation of KCCV assembly	50-118
Removal and installation of air cleaner assembly	50-120
Removal and installation of air conditioner compressor assembly.....	50-122
Removal and installation of air conditioner condenser assembly	50-124
Power train system	50-126
Removal and installation of travel motor and final drive assembly	50-126
Disassembly and assembly of final drive	50-127
Removal and installation of swing motor and swing machinery assembly	50-136
Disassembly and assembly of swing machinery.....	50-138
Removal and installation of swing circle assembly	50-145
Undercarriage and frame.....	50-146
Separation and connection of track shoe assembly	50-146
Removal and installation of sprocket.....	50-149
Removal and installation of idler and idler cushion assembly	50-150
Disassembly and assembly of idler.....	50-151
Disassembly and assembly of idler cushion.....	50-154
Disassembly and assembly of track roller.....	50-156
Disassembly and assembly of carrier roller.....	50-158
Removal and installation of revolving frame assembly	50-161
Removal and installation of counterweight assembly	50-163
Hydraulic system	50-167
Removal and installation of center swivel joint assembly	50-167
Disassembly and assembly of center swivel joint	50-169
Removal and installation of hydraulic tank assembly	50-170
Removal and installation of main pump assembly	50-173
Removal and installation of control valve assembly	50-177
Disassembly and assembly of control valve.....	50-183
Disassembly and assembly of work equipment PPC valve.....	50-188
Disassembly and assembly of travel PPC valve.....	50-190
Work equipment	50-192
Removal and installation of bucket assembly.....	50-192
Removal and installation of arm assembly.....	50-193
Removal and installation of work equipment assembly	50-195
Disassembly and assembly of work equipment cylinder.....	50-198
Cab and its attachments.....	50-204
Removal and installation of operator's cab assembly.....	50-204
Removal and installation of operator cab glass (adhered glass)	50-209
Removal and installation of front window assembly	50-219
Removal and installation of floor frame assembly.....	50-225
Removal and installation of air conditioner unit assembly.....	50-231
Removal and installation of operator's seat.....	50-235
Removal and installation of seat belt.....	50-237
Removal and installation of front wiper assembly	50-239
Electrical system	50-246
Removal and installation of engine controller assembly	50-246
Removal and installation of pump controller assembly	50-249
Removal and installation of machine monitor assembly	50-252
Removal and installation of pump swash plate sensor	50-254
Removal and installation of mass air flow and temperature sensor	50-255
Removal and installation of KOMTRAX terminal assembly	50-256
60 Maintenance standard.....	60-1
Table of contents	60-2
Engine and cooling system	60-3
Engine mount	60-3
Cooling system	60-4
Power train system	60-5
Swing circle	60-5


Swing machinery	60-6
Final drive	60-8
Undercarriage and frame	60-10
Sprocket	60-10
Track frame and idler cushion	60-12
Idler	60-14
Track roller	60-16
Carrier roller	60-18
Track shoe	60-19
Hydraulic system	60-22
Hydraulic tank	60-22
Main pump	60-23
Control valve	60-24
Swing motor	60-34
Travel motor	60-36
PPC valve	60-39
Solenoid valve	60-50
Attachment circuit selector valve	60-51
Center swivel joint	60-52
Work equipment	60-53
Work equipment	60-53
Work equipment cylinder	60-62
80 Appendix	80-1
Table of contents	80-2
Air conditioner components	80-3
Precautions for refrigerant	80-3
Air conditioner component	80-4
Configuration and function of refrigeration cycle	80-7
Outline of refrigeration cycle	80-8
Air conditioner unit	80-10
Dual pressure switch	80-17
Air conditioner controller	80-18
Compressor	80-19
Condenser	80-20
Receiver drier	80-21
Sunlight sensor	80-22
Outer temperature sensor (outside air temperature sensor)	80-23
Procedure for testing and troubleshooting	80-24
Circuit diagram and arrangement of connector pins	80-26
System diagram	80-28
Input and output signals of the air conditioner controller	80-29
Parts and connectors layout	80-31
Layout of air conditioner related parts and connectors	80-32
Testing air leakage (duct)	80-35
Testing with self-diagnosis function	80-38
How to open the electrical system abnormality record screen in service mode of the machine monitor	80-39
Testing vent (mode) changeover	80-41
Testing FRESH/RECIRC air changeover	80-43
Testing sunlight sensor	80-44
Testing (dual) pressure switch for refrigerant	80-45
Testing relays	80-47
Troubleshooting chart 1	80-48
Troubleshooting chart 2	80-49
Information in troubleshooting table	80-52
Failure code list related to air conditioner	80-53
Failure code [879AKA] A/C Inner sensor Open Circuit	80-54
Failure code [879AKB] A/C Inner sensor Short Circuit	80-55
Failure code [879BKA] A/C Outer sensor Open Circuit	80-56

Failure code [879BKB] A/C Outer sensor Short Circuit	80-58
Failure code [879CKA] Ventilating sensor Open Circuit	80-60
Failure code [879CKB] Ventilating sensor Short Circuit	80-61
Failure code [879DKZ] Sunlight sensor Open or Short Circuit	80-62
Failure code [879EMC] Ventilating Damper Abnormality	80-64
Failure code [879FMC] Air Mix Damper Abnormality	80-65
Failure code [879GKX] Refrigerant Abnormality	80-66
A-1 Troubleshooting for power supply system (Air conditioner does not operate)	80-67
A-2 Troubleshooting for compressor and refrigerant system (Air is not cooled)	80-69
A-3 Troubleshooting for blower motor system (No air comes out or air flow is abnormal)	80-72
A-4 Troubleshooting for FRESH/RECIRC air changeover	80-74
Troubleshooting with gauge pressure	80-76
Connection of service tool	80-79
Precautions for disconnecting and connecting air conditioner piping	80-81
Handling of compressor oil	80-83
90 Diagrams and drawings	90-1
Table of contents	90-2
Hydraulic circuit diagram	90-3
Symbols in hydraulic circuit diagram	90-3
Hydraulic circuit diagram	90-7
Electric circuit diagram	90-9
Symbols in electric circuit diagram	90-9
Electric circuit diagram	90-13
Electric circuit diagram for air conditioner unit	90-25
Failure code [CA3741] Rail Press Valve Trip Error	
Index	1


Foreword, safety and general information (ALL-0370-001-A-00-A)

Important safety notice (ALL-1120-012-A-01-A)

(Rev. 2012/10)

- Appropriate servicing and repair are extremely important to ensure safe operation of the machine. The shop manual describes the effective and safe servicing and repair methods recommended by Komatsu. Some of these methods require the use of the special tools designed by Komatsu for the specific purpose.
- The symbol mark  is used for such matters that require special cautions during the work. The work indicated by the caution mark should be performed according to the instructions with special attention to the cautions. Should hazardous situation occur or be anticipated during such work, be sure to keep safe first and take every necessary measure.

General precautions

 **Inappropriate handling causes an extreme danger. Read and understand what is described in the operation and maintenance manual before operating the machine. Read and understand what is described in this manual before starting the work.**

- Before performing any greasing or repairs, read all the safety labels stuck to the machine. For the locations of the safety labels and detailed explanation of precautions, see the operation and maintenance manual.
- Locate a place in the repair workshop to keep the tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt, water or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.
- When performing any work, always wear the safety shoes and helmet. Do not wear loose work cloths, or clothes with buttons missing.
 1. Always wear the protective eyeglasses when hitting parts with a hammer.
 2. Always wear the protective eyeglasses when grinding parts with a grinder, etc.
- When performing any work with two or more workers, always agree on the working procedure before starting. While working, always keep conversations of the work between your fellow workers and your self on any step of the work. During the work, hang the warning tag of "UNDER WORKING" in the operator's compartment.
- Only qualified workers must perform the work and operation which require license or qualification.
- Keep the tools in good condition. And learn the correct way to use the tools, and use the proper ones among them. Before starting the work, thoroughly check the tools, lift truck, service vehicle, etc.
- If welding repairs is required, always have a trained and experienced welder with good

knowledge of welding perform the work. When performing welding work, always wear welding gloves, apron, shielding goggles, cap, etc.

- Before starting work, warm up your body thoroughly to start work under good condition.
- Avoid continuing work for long hours and take rests with proper intervals to keep your body in good condition. Take a rest in a specified safe place.

Safety points

1	Good arrangement
2	Correct work clothes
3	Observance of work standard
4	Practice of making and checking signals
5	Prohibition of operation and handling by unlicensed workers
6	Safety check before starting work
7	Wearing protective goggles (for cleaning or grinding work)
8	Wearing shielding goggles and protectors (for welding work)
9	Good physical condition and preparation
10	Precautions against work which you are not used to or you are used to too much

Preparation

- Before adding oil or making any repairs, place the machine on a firm and level ground, and apply the parking brake and chock the wheels or tracks to prevent the machine from moving.
- Before starting work, lower the work equipment (blade, ripper, bucket, etc.) to the ground. If it is not possible to lower the equipment to the ground, insert the lock pin or use blocks to prevent the work equipment from falling. And be sure to lock all the work equipment control levers and hang a warning tag on them.
- When performing the disassembling or assembling work, support the machine securely with blocks, jacks, or stands before starting the work.
- Remove all of mud and oil from the steps or other places used to get on and off the machine completely. Always use the handrails, ladders of

steps when getting on or off the machine. Never jump on or off the machine. When the scaffold is not provided, use steps or stepladder to secure your footing.

Precautions during work

- For the machine equipped with the battery disconnect switch, check that the system operating lamp is turned off before starting the work. Then, turn the battery disconnect switch to OFF (○) position and remove the switch key. For the machine not equipped with the battery disconnect switch, remove the cable from the battery before starting the work. Be sure to remove the negative end (-) of the battery cable first.
- Release the remaining pressure in the circuits completely before the work when the parts in the circuits of oil, fuel, coolant and air are disconnected or removed. When the cap of the oil filter, drain plug or oil pressure pickup plug is removed, loose them slowly to prevent the oil from spurting out.
- When removing or installing the checking plug or the piping in the fuel circuit, wait 30 seconds or longer after the engine is shut down and start the work after the remaining pressure is released from the fuel circuit.
- Immediately after the engine is shut down, the coolant and oil in the circuits are hot. Be careful not to get scalded by the hot coolant and oil. Start the work after checking that the coolant and oil are cooled down sufficiently.
- Start the work after the engine is shut down. Be sure to shut down the engine when working on or around the rotating parts in particular. When checking the machine without shutting down the engine (measuring oil pressure, rotational speed, oil or coolant temperature), take extreme care not to get caught in the rotating parts or the working equipment.
- The hoist or crane must be used to sling the components weighing 25 kg or heavier. Check the slings (wire rope, nylon sling, chain and hook) for damage before the work. Use the slings with ample capacity and install them to the proper places. Operate the hoist or crane slowly to prevent the component from hitting any other part. Do not work with any part still raised by the hoist or crane.
- When removing the part which is under internal pressure or reaction force of the spring, always leave 2 bolts in diagonal positions. Loosen those 2 bolts gradually and alternately and release the pressure, then, remove the part.
- When removing the part, be careful not to break or damage the electrical wiring. The damaged wiring may cause electrical fires.
- When removing piping, prevent the fuel or oil from spilling out. If any fuel or oil drips onto the floor, wipe it off immediately. Fuel or oil on the floor can cause you to slip and can even cause fires.
- As a general rule, do not use gasoline to wash parts. Do not use gasoline to clean the electrical parts, in particular.
- Reinstall the parts removed to their original places. Replace the damaged parts and the parts which must not be used with new ones. When installing the hoses and wiring harnesses, be careful that they are not damaged by contacting with other parts when the machine is operated.
- When connecting the high pressure hoses and tubes, make sure that they are not twisted. The damaged high pressure hoses and tubes are very dangerous when they are installed. So, be extremely careful when connecting the high pressure pipings. In addition, check that their connections are correct.
- When assembling or installing the parts, be sure to tighten the bolts to the specified torque. When installing the protective parts such as guards, or the parts which vibrate violently or rotate at high speeds, be sure to check that they are installed correctly.
- When aligning 2 holes, never insert your fingers or hand into the holes. Align the holes with care so that your fingers are not caught in the hole.
- When measuring hydraulic pressure, check that the measuring tools are correctly installed.
- Pay attention to safety when removing and installing the tracks of the track type machines. When removing the track, it separates suddenly. The workers should not stand at either end of the track.
- If the engine is operated for a long time in a closed place which is not ventilated well, you may suffer from gas poisoning. Accordingly, open the windows and doors to ventilate the place well.

Precautions for slinging work and making signals

- Only one appointed worker must make signals and co-worker must communicate with each other frequently. The appointed signaler must make specified signals clearly at the place where the signaler is well seen from the operator's seat and where the signaler can see the working condition easily. The signaler must always stand in front of the load and guide the operator safely.
 1. Do not stand under the load.
 2. Do not step on the load.
- Check the slings before starting sling work.

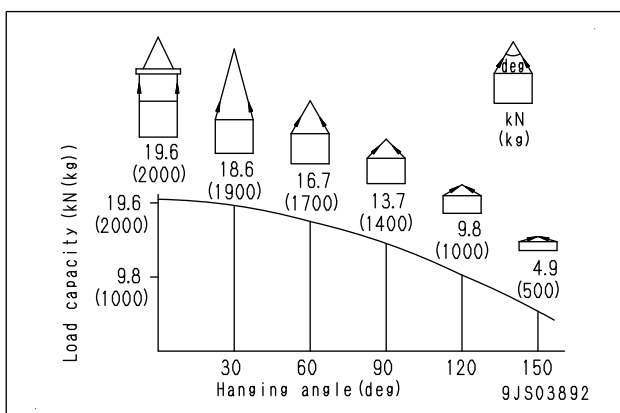
00 Index and foreword

Foreword, safety and general information

- Keep putting on the gloves during sling work. (Put on the leather gloves, if available.)
- Measure the weight of the load by the eye and check its center of gravity.
- Use the proper sling according to the weight of the load and method of slinging. If too thick wire ropes are used to sling a light load, the load may slip and fall.
- Do not sling a load with 1 wire rope only. If do so, the load may rotate or the sling gets loose and the sling may slip off. Install 2 or more wire ropes symmetrically.

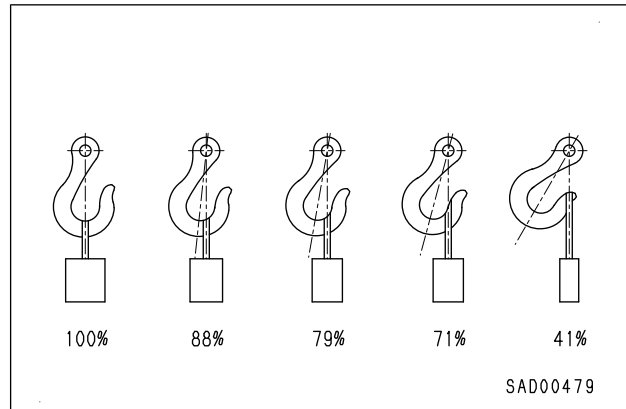
⚠ Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original slinging position on the load, which can result in a dangerous accident.

- Hanging angle must be 60 degrees or smaller as a rule.
- When hanging a heavy load (25kg or heavier), the hanging angle of the rope must be narrower than that of the hook.
- ★ When slinging a load with 2 ropes or more, the larger the hanging angle is, the larger the tension of each rope. The figure below shows the variation of allowable load in kN {kg} when hoisting is made with 2 ropes, each of which is allowed to sling up to 9.8 kN {1000kg} a load vertically, at various hanging angles. When the 2 ropes sling a load vertically, up to 19.6 kN {2000 kg} of total weight can be suspended. This weight is reduced to 9.8 kN {1000 kg} when the 2 ropes make a hanging angle of 120 degrees. If the two ropes sling a 19.6 kN {2000 kg} load at a hanging angle of 150 degrees, each rope is subjected to a force as large as 39.2 kN {4000 kg}.



- When installing wire ropes to an angular load, apply pads to protect the wire ropes. If the load is slippery, apply proper material to prevent the wire rope from slipping.

- Use the specified eye bolts and fix wire ropes, chains, etc. to them with shackles, etc.
- Apply wire ropes to the middle part of the hook.
 - ★ Slinging near the tip of the hook may cause the rope to slip off the hook during hoisting. The strength of the hook is maximum at its central part.




- Do not use twisted or kinked wire ropes.
- When slinging up a load, observe the following.
 1. Wind up the rope slowly until the wire rope tensions. When putting your hands on the wire ropes, do not grasp them but press them down from above. If you grasp them, your fingers may be caught.
 2. After the wire ropes are stretched, stop the crane and check the condition of the slung load, wire ropes, and pads.
 3. If the load is unstable or the wire rope or chains are twisted, lower the load and lift it up again.
 4. Do not lift up the load at an angle.
- When lowering a load, pay attention to the following.
 1. When lifting down a load, stop it temporarily at 30 cm above the floor, and then lower it slowly.
 2. Check that the load is stable, and then remove the sling.
 3. Remove kinks and dirt from the wire ropes and chains used for the sling work, and put them in the specified place.

Precautions for using mobile crane

- ★ Read the Operation and Maintenance Manual of the crane carefully in advance and operate the crane safely.

Precautions for using overhead traveling crane

- ⚠ The hoist or crane must be used to sling the components weighing 25 kg or heavier. A part weighing 25 kg or heavier in "disassembly and assembly" section is indicated with the symbol of .

- Before starting work, check the wire ropes, brake, clutch, controller, rails, over winding prevention device, ground fault circuit interrupter for electric shock prevention, crane collision prevention device, and energizing warning lamp, and check the following safety items.
- Observe the signals for sling work.
- Operate the hoist at a safe place.
- Be sure to check the directions of the direction indication plate (north, south, east and west) and the operating button.
- Do not sling a load at an angle. Do not move the crane while the slung load is swinging.
- Do not raise or lower a load while the crane is moving longitudinally or laterally.
- Do not drag a sling.
- When lifting up a load, stop it just after it leaves the ground and check safety, and then lift it up.
- Consider the travel route in advance and lift up a load to a safe height.
- Place the control switch in a position where it will not be an obstacle to work and passage.
- After operating the hoist, do not swing the control switch.
- Remember the position of the main switch so that you can turn off the power immediately in an emergency.
- Shut down the main switch when the hoist stops because of a blackout. When turning on a switch which is turned OFF by the ground fault circuit interrupter for electric shock prevention, check that the devices related to that switch are not in operating condition.
- If you find an obstacle around the hoist, stop the operation.
- After finishing the work, stop the hoist at the specified position and raise the hook to at least 2 meters above the floor. Do not leave the sling attached to the hook.

Selecting wire ropes

- Select adequate ropes depending on the weight of the parts to be hoisted, referring to the table below

Wire rope (JIS G3525, 6 x 37 - Type A)

(Standard Z twist wire ropes without galvanizing)

Nominal diameter of rope	Allowable load	
	kN	ton
mm		
10	8.8	0.9
12	12.7	1.3
14	17.3	1.7
16	22.6	2.3
18	28.6	2.9
20	35.3	3.6
25	55.3	5.6
30	79.6	8.1
40	141.6	14.4

Nominal diameter of rope	Allowable load	
	kN	ton
mm		
50	221.6	22.6
60	318.3	32.4

- ★ The allowable load is calculated as one sixth of the breaking load of the rope to be used (safety coefficient: 6).

Precautions for disconnecting and connecting hoses and tubes in air conditioner circuit

Disconnection

⚠ When replacing the air conditioner unit, air conditioner compressor, condenser or receiver drier, etc., collect the refrigerant (air conditioner gas: R134a) from the air conditioner circuit before disconnecting the air conditioner hoses.

- ★ Ask a qualified person for collecting, adding and filling operations of the refrigerant (air conditioner gas: R134a). (Only registered persons can work.)
- ★ Never release the refrigerant (air conditioner gas: R134a) to the atmosphere.

⚠ If refrigerant gas (air conditioner gas: R134a) gets in your eyes, you may lose your sight. And if it touches your skin, you may suffer from frostbite. Put on protective eyeglasses, gloves and working clothes with long sleeves while collecting the refrigerant or filling the air conditioner circuit with the refrigerant.

- When loosening the nuts fixing air conditioner hoses and tubes, be sure to use 2 wrenches; use one wrench to fix and use the other one to loosen the nut.

Connection

- When installing the hose for the air conditioner circuit, take care not to allow invasion of dirt, dusts and water into the hose.
- Check that the O-rings are fitted to the joints when connecting the air conditioner piping.
- Once an O-ring is used, it is deformed and deteriorated. Accordingly, do not reuse it.
- When removing the O-rings, use a soft tool so that the piping is not damaged.
- Check that the O-ring is not damaged or deteriorated.
- Apply compressor oil for refrigerant (R134a) to the O-ring.
 - ★ However, do not apply oil to the threaded portion of a bolt, nut or union.

00 Index and foreword

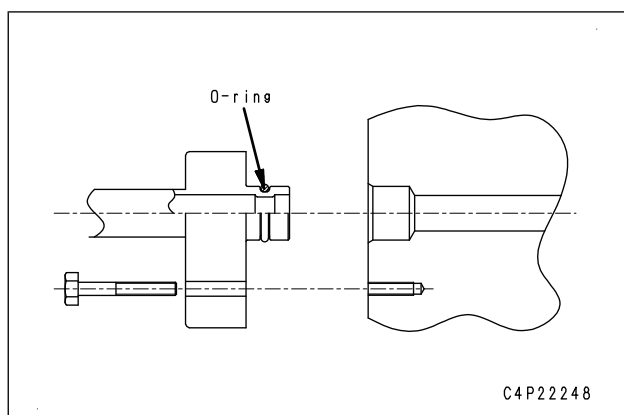
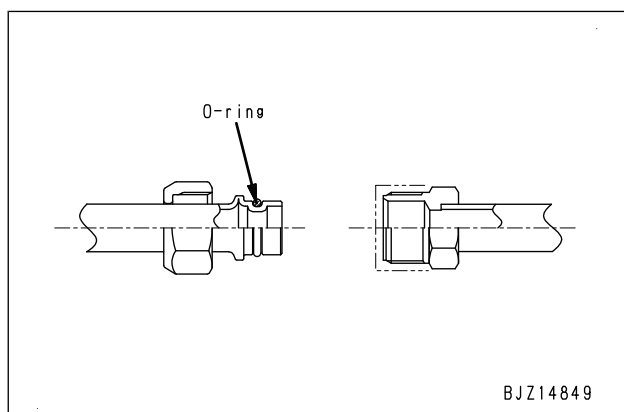
Foreword, safety and general information

Manufacturer	Part name
DENSO	ND-OIL8
VALEO THERMAL SYSTEMS	ZXL100PG (equivalent to PAG46)
SANDEN	SP-10

- When tightening nuts of the air conditioner hoses and tubes, be sure to use 2 wrenches. Use one wrench to fix and tighten the nut with the other wrench to the specified torque (Use a torque wrench for tightening).

★ Example of fitting of O-ring

- An O-ring is fitted to every joint of the air conditioner piping.



**For tightening torques, see "Others",
"Precautions for disconnection and connection
of air conditioner piping".**