SUPPLEMENT No. 10

S-TEC SYSTEM 55 AUTOPILOT

This Supplement must be included in the Z 143 L - Z 143 LSi Airplane Maintenance Manual (Doc. No. 005.022.2), Chapter 95, AUTOPILOT S-TEC 55 or 55 X when is installed.

The information contained herein supplements or supersedes the information in Z 143 L - Z 143LSi Airplane Maintenance Manual (Doc. No. 005.022.2).

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95-100-00	95/100-1	2011-02-02	All
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	95/100-5	2011-02-02	All
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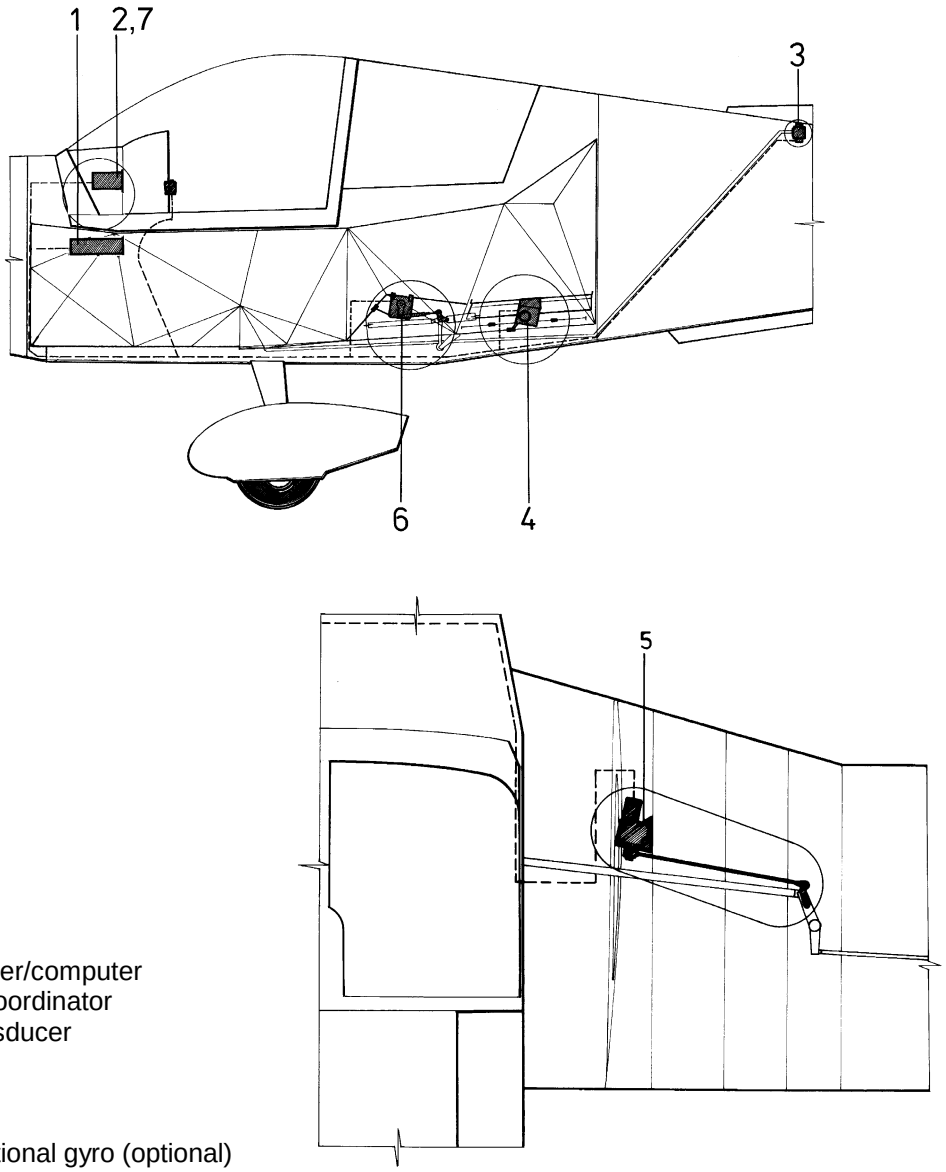
S-TEC SYSTEM 55 AUTOPILOT

GENERAL

S-TEC System 55 or S-TEC 55X Autopilot is the two axis system (pitch and roll axis).

DESCRIPTION AND OPERATION

Functions and modes of the autopilot are described in detail in the SYSTEM 55 AUTOPILOT or 55 X Pilot's Operating Handbook (last valid Revision).



1 – AP programmer/computer
2 – electric turn coordinator
3 – pressure transducer
4 – trim servo
5 – roll servo
6 – pitch servo
7 – vacuum directional gyro (optional)

Fig. 1 Autopilot components location in the aircraft

MAINTENANCE

REMOVAL AND INSTALLATION

REMOVAL OF THE AP PROGRAMMER/COMPUTER FROM THE AIRCRAFT

Loose the screw on the lower side of the device front panel with the 3/32“ Allen wrench. After loosing the screw move out the central unit from the instrument panel in the direction to the pilot’s compartment.

INSTALLATION OF THE AP PROGRAMMER/COMPUTER TO THE AIRCRAFT

Insert the autopilot central unit from the front side into the instrument panel. After the insertion push to the front panel, to plug the electric connector into the counterpart in the panel frame. Softly tighten the screw with the internal hexagon on the lower side of the device front panel with the 3/32“ wrench.

REMOVAL OF THE PRESSURE TRANSDUCER FROM THE AIRCRAFT Fig. 2

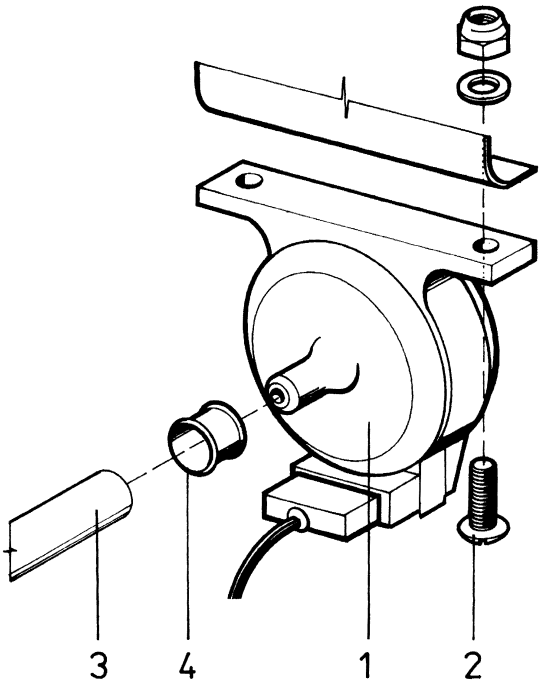
Before removal of the pressure transducer (1) provide the access to the rear part of the fuselage by pulling the head restraint from the left rear seat and by opening the shield behind the upper baggage compartment in the cabin. To avoid sagging of the floor of the upper baggage compartment, place the hard mat at the floor before entering the rear part of the fuselage. Disconnect the static pressure hose (3), (blind off the hose), and the electrical installation connector. Loose and screw off the screws (2) and put off the pressure transducer. After removal, blind off the socket of the static pressure inlet to the transmitter.

INSTALLATION OF THE PRESSURE TRANSDUCER TO THE AIRCRAFT

Fix the pressure transducer on the bracket, using screws (2), connect the static pressure tubing, clamp with the sleeve (4) and connect the connector of the electric installation. After the tightness test of the static pressure system assemble the head restraint on the left rear seat and close the shield of the upper baggage compartment.

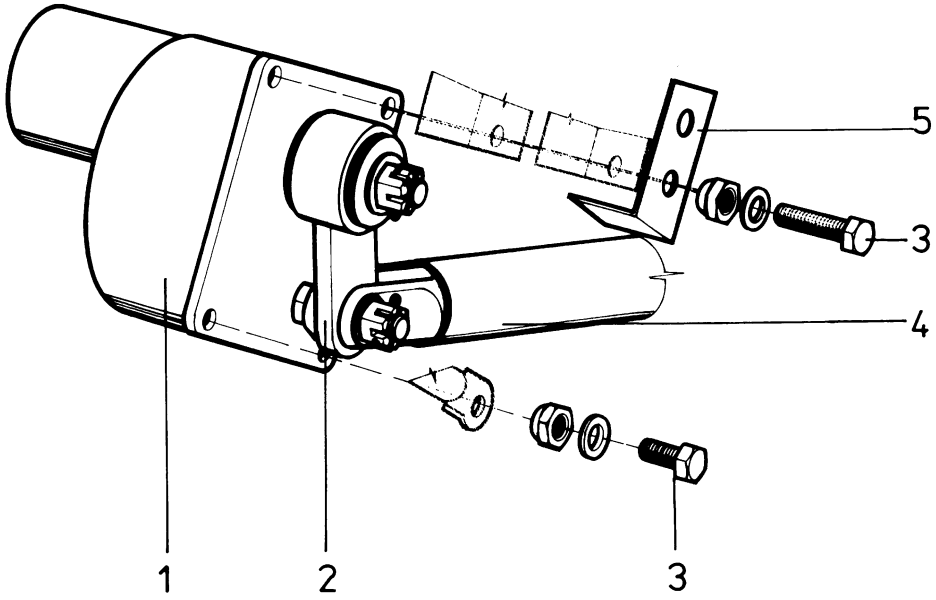
CAUTION:

AFTER REMOVAL AND EVENTUAL PRESSURE TRANSDUCER (1) EXCHANGE EXECUTE THE TIGHTNESS TEST OF THE STATIC SYSTEM ACC. TO SECTION 34-10-00.



1 - pressure transducer
2 - screw
3 - hose
4 - sleeve

Fig. 2 Installation of pressure transducer



1 - pitch servo
2 - lever
3 - screw
4 - rod
5 - safety stop

Fig. 3 Installation of pitch servo

REMOVAL OF THE PITCH SERVO FROM THE AIRCRAFT Fig. 3

Remove rear seats from the cabin (Section 25-20-00) and remove the shield from the floor. Disconnect the rod (4) from the lever (2) and the connector of electric installation. Screw off the screws (3) from the servo flange and remove the servo from the aircraft.

INSTALLATION OF THE PITCH SERVO TO THE AIRCRAFT

Set the servo on holes in the hinges consoles (including safety stop (5), tighten the screws (3). Joint the rod (4) to the lever (2) and fix with the nut and the cotter pin. Connect the electric installation cable to the connector and fix it with a tape. Check with control lever movement in cabin from PULL MAX. to PUSH MAX., whether there doesn't occur hitching at the control movement and whether there is a sufficient play between movable parts of control system and fixed parts of fuselage frame on servo at the lever deflections. Fasten the shield on the floor between seats and under rear baggage compartment. Install rear seats (Section 25-20-00).

CAUTION

1. BEFORE SERVO INSTALLING INTO THE AIRCRAFT, THE TORQUE MOMENT ON SERVO MOMENT CLUTCH SHALL BE ADJUSTED ACCORDING TO TABLE No. 1.
2. AT SERVO REMOVAL OR REPLACEMENT, PITCH SERVO **P/N 0108-P4** AND ROLL SERVO **P/N 0106-1-R4** SHALL NOT BE CONFUSED SIMILARLY, IF REMOVING SERVO LEVERS, THE ROLL SERVO LEVER IS LONGER THEN THE PITCH SERVO LEVER.
3. THE MINIMUM DISTANCE BETWEEN PITCH SERVO LEVER AND THE SAFETY STOP IS 1 MM I.E. 0.04 IN (IN FULL BACK LEVER POSITION).

ROLL SERVO REMOVAL FROM AIRCRAFT Fig. 4

Remove transition cover between fuselage and right wing. Disconnect the electro-installation connector from servo. Disconnect adjustable rod (5) from the servo lever (2). Screw off countersink screws (3) and hexagonal head screws (4) from servo attachment. Take out the servo from aircraft.

ROLL SERVO INSTALLATION INTO THE AIRCRAFT

Locate servo (1) onto the holes of console in wing. Screw two countersink screws (3) in the upper holes and two screws with hexagonal head (4) with nut and washer in the lower holes. Attach the rod (5) to the lever (2) and secure with nut and split pin. Attach the electro-installation connector to servo and fix with a tape. Check at the full control lever deflection in lateral direction, whether hitching does not occur and whether lever (2) and rod (5) have sufficient play at deflections to extreme positions. Fit on transition cover between fuselage and right wing.

CAUTION

BEFORE SERVO INSTALLING INTO THE AIRCRAFT, THE TORQUE MOMENT ON SERVO MOMENT CLUTCH SHALL BE ADJUSTED ACCORDING TO TABLE No. 1.

NOTE

Installation and removal of pitch trim servo are given in Supplement No.11.

1 - pitch servo
2 - lever
3 - countersink screw (above)
4 - screw
5 - rod

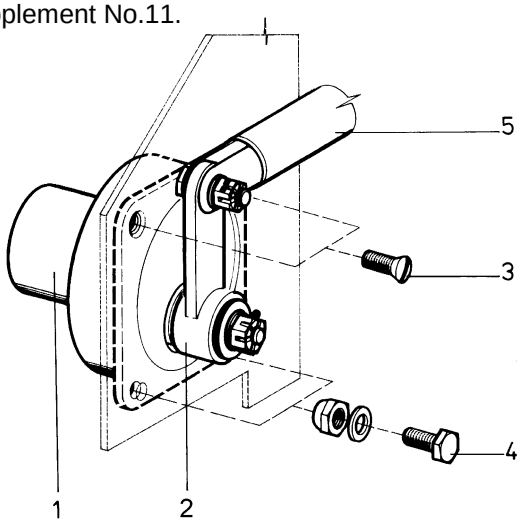


Fig. 4 Pitch servo installation

EFFECTIVITY: ALL

INSPECTION AND CHECK

CHECK OF THE AUTOPILOT FUNCTION AND CONDITION

After 100 flight hours or after one year (what comes first) check:

1. SERVOS - condition, nuts locking, free movement

2. CHECK OF FORCE TO OVERCOME MOMENT CLUTCHES

Checking method

Switch-on and activate the autopilot acc. to the procedure presented in SYSTEM 55 AUTOPILOT or 55 X Pilot's Operating Handbook (last valid Revision).
In the centre of the control lever handle, measure with dynamometer (by pressure or tension) a force necessary for slipping of moment clutches to position LEFT, RIGHT, PUSH, and PULL. The force size shouldn't exceed value 11 lbs (50 N). The control movement must be fluent, without hitching at the moment of slipping of moment clutches.

IN CASE THAT MEASURED VALUES DON´ T CORRESPOND TO SPECIFIED RANGE OF FORCES, ADJUST MOMENT CLUTCHES ON SERVOS IN THE FOLLOWING WAY:

I. CHECK AND ADJUSTMENT OF MOMENT CLUTCHES ON AUTOPILOT S-55 TEC

This procedure is valid for following servo types of manufacturer S-TEC:

Pitch servo, type P/N 0108-P4
– lever control movement output
– servo is equipped with sensor for cooperation with trim servo.

Roll servo, type P/N 0106-1-R4
– lever control movement output.

Trim servo, type P/N 0106-T12
– control movement output with winch rope.

II. EQUIPMENT NEEDED FOR CHECK OF SERVOS MOMENT CLUTCHES ADJUSTMENT OUTSIDE THE AIRCRAFT

NOTE

Mk = torque moment on servos moment clutches

a) a board attaching of servo for Mk measuring and adjustment, Drwg No. L 143.9250-00.06
b) stabilized power unit 28 DC - 10 A
c) connecting cable between power unit and servo, Drwg No. L 143.9250-04.00
d) nut wrench (socket or open-end) 1/2″
e) ring (adapter) between servo and moment wrench:
  A) for pitch and roll servos with lever control movement output, Drwg No. L 143.9250-02.00
  B) for trim servo with winch rope control movement output, Drwg No. L 143.9250-03.00
f) torque wrench with range 0 ÷ 100 lb.in (0 ÷ 12 Nm) with possibility of reading 1 lb.in (0.12 Nm).

III. EQUIPMENT NECESSARY FOR CHECK AND ADJUSTMENT OF SERVOS MOMENT CLUTCHES IN AIRCRAFT

a) ring (adapter) between servo and moment wrench:
  A) for pitch and roll servos with lever control movement output, Drwg No. L 143.9250-02.00
  B) for trim servo with winch rope movement output, Drwg No. L 143.9250-03.00
b) torque wrench with range 0 ÷ 100 lb.in (0 ÷ 12 Nm) with possibility of reading 1 lb.in (0.12 Nm).
c) nut wrench (socket or open-end) 1/2″.

TABLE 1. – Mk SERVO SETTING-UP VALUES

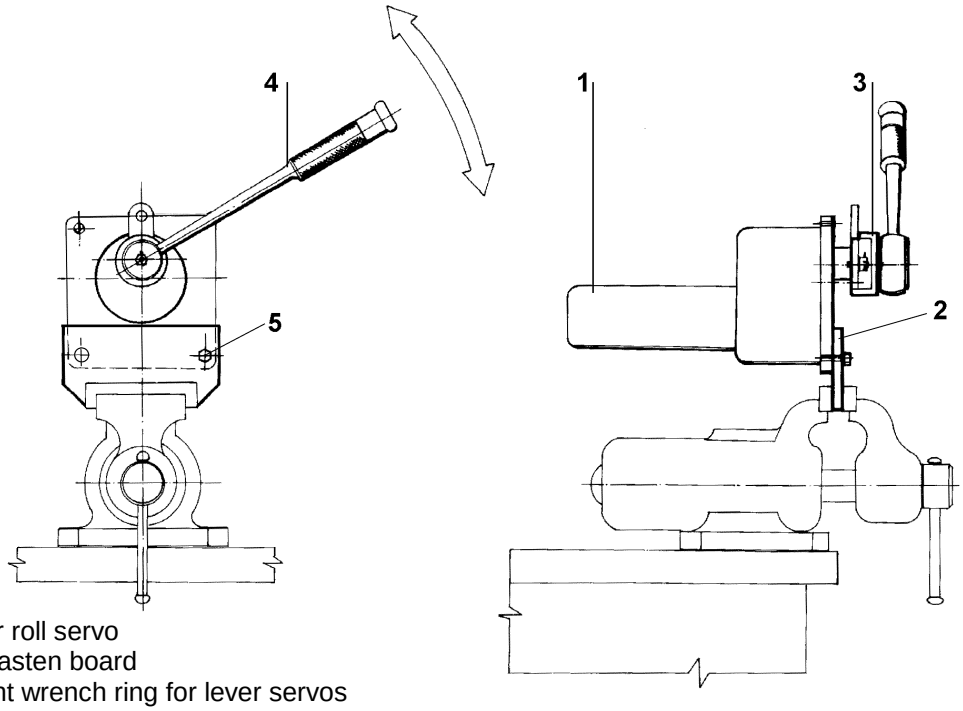
	Mk	
Servo	lb.in	Nm
Pitch servo P/N 0108-P4	50 ± 2	5.76 ± 0.23
Roll servo P/N 0106-1-R4	75 ± 2	8.64 ± 0.23
Trim servo P/N 0106-T12	48 ± 2	5.53 ± 0.23

NOTE
Values given in tab. 1 are valid at ambient temperatures 18°C ÷ 22°C.

IV. PITCH AND ROLL SERVOS MOMENT CLUTCHES CHECK AND ADJUSTMENT PROCEDURE OUTSIDE THE AIRCRAFT

a) Fasten the board (Fig. 5, pos. 2) into the workshop vice on the worktable.
b) Fasten the servo (1) with 2 pcs of screws (5) onto the board (2).
c) Locate a ring (3) for moment wrench onto the servo shaft.
d) Insert the power unit cable connector (28 V DC) into the servo connector.
e) Switch on the power unit and locate the moment wrench (4) into the ring (3).
f) Check the torque moment (Mk) value that has to be adequate according to measured servo type to values given in Tab. 1. Turn the moment wrench in both directions.

NOTE
If the measured value Mk doesn't match the value given in Tab. 1, adjustment a moment clutch according to procedure given in paragraphs VI.



1 ... pitch or roll servo
2 ... servo fasten board
3 ... moment wrench ring for lever servos
4 ... moment wrench
5 ... servo attaching screw

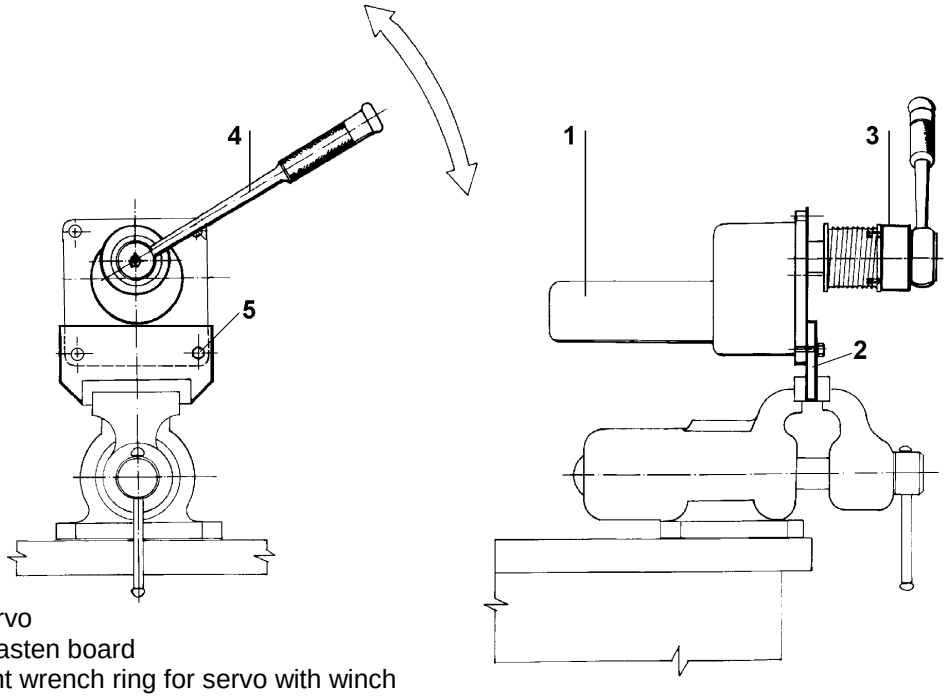
Fig. 5 Pitch and roll servo attaching for Mk measurement

V. PROCEDURE AT CHECK AND ADJUSTMENT OF TRIM SERVO MOMENT CLUTCH OUTSIDE THE AIRCRAFT

a) If a rope is wound on the servo winch, fix both the ends with clamp (or binding wire) so as not to unwind a rope.
b) Remove 4 screws of winch cover on the servo.
c) Take off the front cover from the winch.
d) Fix the servo (Fig. 6, pos. 1) with of 2 pcs of screws (5) onto the board (2). Fasten the board to the vice on the worktable.
e) Locate onto the servo winch (1) ring (3) for moment wrench (4).
f) Insert the power unit cable connector (28 V DC) into the servo connector.
g) Switch on the power unit and locate the moment wrench (4) into the ring (3).
h) Check the torque moment value (Mk) that has to be accord with the value in Table 1. Turn the moment wrench (4) in bot directions.

NOTE

If the measured value of Mk doesn't match value given in Tab. 1, carry out adjustment a moment clutch according to procedure given in paragraph VI.



1 ... trim servo
2 ... servo fasten board
3 ... moment wrench ring for servo with winch
4 ... moment wrench
5 ... servo attaching screw

Fig. 6 Trim servo clamping for Mk measuring

VI. SERVO MOMENT CLUTCHES ADJUSTMENT OUTSIDE THE AIRCRAFT

CAUTION

DURING ADJUSTMENT OF MOMENT CLUTCHES ON SERVOS, ANY CONTAMINATION WITH GREASE FROM DISC SPRING AND ADJUSTING NUT MUST NOT OCCUR.

NOTE

The procedure of moment clutch adjustment is at both servo types (with lever output for pitch or roll control, and rope output for trim) the same. There has to be removed the front cover of winch on the trim servo and fixed rope against unwinding.

Record the Mk measured values into the Measurement record (MP-L 143 .812; see page 95/100-12).

a) fasten the board (2) to vice and the fasten servo (1) with two screws (5) on the board.
b) insert the power unit connector (28 V DC) into the servo connector. Switch on the power unit.
c) take off the split pin of nut on the servo-shaft.
d) put on the 5/8″ wrench onto the nut.
– by turning the nut to the right (tightening) the Mk value on the moment coupling is increasing
– by turning the nut to the left (loosening) the Mk value on the moment coupling is lowering.
e) Check a set of value Mk:
– at pitch and roll servos according to procedure given in paragraph IV. c, f.
– at trim servo acc. to procedure given in par. V. e, h.

VII. PROCEDURE AT CHECK AND ADJUSTMENT OF PITCH SERVO MOMENT CLUTCH WITHOUT REMOVAL FROM THE AIRCRAFT

a) remove rear seats from the aircraft.
b) disconnect short control rod from the servo lever.
c) activate the autopilot:

MASTER SWITCH	ON	
BATTERY SWITCH	ON	} as needed
EXTERNAL SOURCE SWITCH	ON	} as needed
FLIGHT INSTRUMENT SWITCH	ON	
AUTOPILOT SWITCH	ON	

After finishing the autopilot selftesting, RDY appears on the AP programmer/computer display.

ALT switch (on the AP programmer/computer)	PUSH
CWS push button on the control lever	PUSH

d) locate a ring (adapter) Drwg No. L 143.9250-02.00 and moment wrench (type TEC 12 A) on the servo.
e) check with moment wrench clockwise turning the Mk value that must accord with the value for pertinent servo in Table 1.
f) if the measured value doesn't accord with the value given in Tab. 1, adjust the moment clutch acc. to procedure in paragraph VI. c, d, e.
g) provide a measurement 3times at ambient temperature 18°C - 20°C.
h) after finishing the Mk adjustment, lock the slotted nut with split pin:
– switch off the switches given in point c)
– connect short rod to the lever and lock the nut with split pin
– check easy running of the control and sufficient between movable and fixed parts around the servo lever and connection to control system by movement of control rod from position PULL MAX. to PUSH MAX. (LEFT MAX. to RIGHT MAX. for roll servo).
i) install rear seats into the aircraft.

VIII. PROCEDURE AT CHECK AND ADJUSTMENT OF ROLL SERVO MOMENT CLUTCH WITHOUT REMOVAL FROM THE AIRCRAFT

a) remove the transition cover wing-fuselage on the right side.
Further procedure is the same as at pitch servo, paragraph VII. b, c, d, e, f, g, h.
b) attach transition cover wing-fuselage on the right side.

IX. PROCEDURE AT CHECK AND ADJUSTMENT OF TRIM SERVO MOMENT CLUTCH WITHOUT REMOVAL FROM AIRCRAFT

a) remove the cover on the floor of rear baggage compartment.
b) locate pitch trim control wheel in cabin to central position.
c) disconnect clamps of servo rope from the pitch trim rope. Fix ends of servo rope with binding wire close to the winch so as not to unwind a rope.
d) remove front cover of the winch.
e) locate a ring (adapter) Drwg No. L 143.9250-03.00 to the front of winch. Connect moment wrench (type TEC 12 A) into the ring.

f) activate electric control of pitch trim:

MASTER SWITCH	ON	
BATTERY SWITCH	ON	} as needed
EXTERNAL SOURCE SWITCH	ON	
FLIGHT INSTRUMENT SWITCH	ON	
EL. TRIM SWITCH	ON	

Use a ring (Fig. 6, pos. 3), Drwg No. L 143.9250-03.00 for trim servo.
Further procedure is the same as at the control servo procedure, paragraph VII. d, e, f, g.

g) after finishing the Mk adjustment, lock the slotted nut with split pin
– switch off the switches listed in point f)
– attach the front cover of winch
– connect clamps of the servo rope to the trim rope, stretch the rope to 13 ÷ 17 lbs (60 ÷ 80 N).
– check easy running of trim servo (from extreme to extreme position) with control wheel in cabin.

h) attach the cover on the floor of rear baggage compartment.

3. CHECK OF AUTOPILOT QUICK DISCONNECTION
Procedure at check
At switched-on autopilot, check connection of servos to control system with pressure on the control lever in longitudinal and lateral direction:
Push AP-DIS push button on left control lever. Immediate disconnection of servos and control lever loosening shall occur. Switch on the autopilot again and repeat the same procedure by pushing the AP-DIS push button on the right control lever.

4. ELECTRIC INSTALLATION CHECK
Check the condition of electric conductors and connections.

NOTE:
In case that operational regulation of the country in which the aircraft is registered specifies different periodicity and way of autopilot test execution, observe this regulation.

APPROVED REPAIRS

AUTOPILOT REPAIRES

Defect	Repair
1) Damaged electric conductors.	Replace electric conductors.
2) Damaged or non-functional any component of autopilot.	Replace the component, the defective one send to licensed service.

ZLIN AIRCRAFT a.s. Otrokovice	RECORD ON ADJUSTMENT AND CHECK OF MOMENT CLUTCHES ON AUTOPILOT S-TEC 55 OR X SERVOS	MP-L 143.812 Pages1,Page1

Aircraft serial number:	Registration number:

NAME	Designation	Specified value of Mk	Measured value of Mk		
			I.	II.	III.
	Serial No.	lb.in	lb.in	lb.in	lb.in
		Nm	Nm	Nm	Nm
Pitch servo	P/N 0108-P4	50 ± 2			
		5.76 ± 0.23			
Roll servo	P/N 0106-1-R4	75 ± 2			
		8.64 ± 0.23			
Trim servo	P/N 0106-T12	48 ± 2			
		5.53 ± 0.23			

Type and size of mom. wrench:	Note:
Air temperature:	

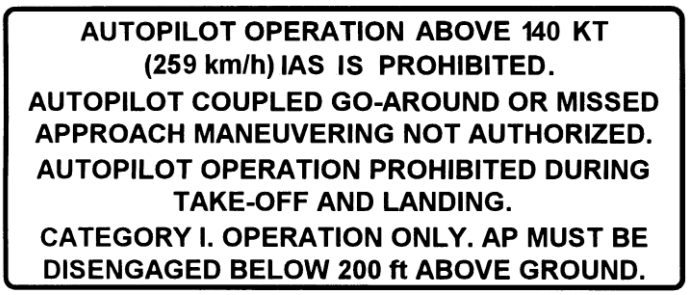
Measurement made by:	Checked by:
Date:	Date:

EFFECTIVITY: ALL

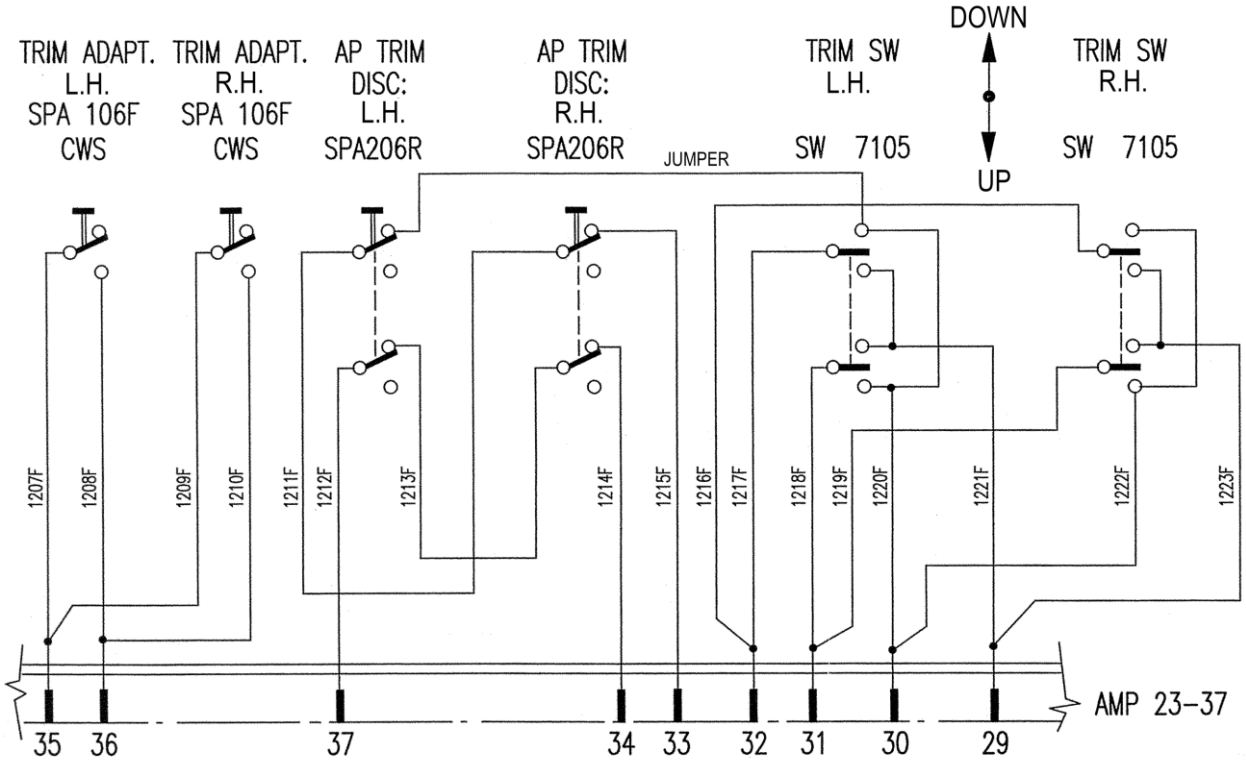
PLACARDS

(1) Placard is located on the central panel.

(2) Placard is located in the pilot cabin.

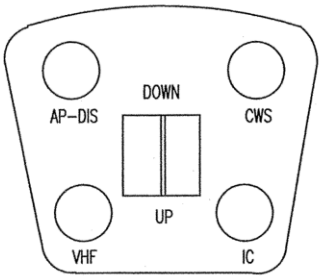


AUTOPILOT CONTROL ELEMENTS AND ELECTRIC TRIM SWITCHES CIRCUIT CONNECTION



AUTOPILOT CONTROL ELEMENTS LAYOUT ON LEFT AND RIGHT CONTROL LEVER

(the layout on both the levers is the same)



IC push button left	SPA 106F (no connect)
VHF push button left	SPA 106F
IC push button right	SPA 106F (no connect)
VHF push button right	SPA 106F
CWS push button left	SPA 106F
CWS push button right	SPA 106F
AP-DIS push button left	SPA 206R
AP-DIS push button right	SPA 206R
TRIM change-over switch left	7105 (2x)
TRIM change-over switch right	7105 (2x)

Marking	Length (m)	S (mm2)	Note
1207F		0,35	AWG22
1208F		0,35	AWG22
1209F		0,35	AWG22
1210F		0,35	AWG22
1211F		0,35	AWG22
1212F		0,35	AWG22
1213F		0,35	AWG22
1214F		0,35	AWG22
1215F		0,35	AWG22
1216F		0,35	AWG22
1217F		0,35	AWG22
1218F		0,35	AWG22
1219F		0,35	AWG22
1220F		0,35	AWG22
1221F		0,35	AWG22
1222F		0,35	AWG22
1223F		0,35	AWG22

Fig. 7 Autopilot control elements layout on left and right control lever

EFFECTIVITY: ALL

AUTOPILOT S-55X CIRCUIT CONNECTION

is mentioned in Supplement No. 2 „COMMUNICATION AND NAVIGATION EQUIPMENT“

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