JOHNSON CONTROLS

FA-3300
Heavy Duty Electric Actuator

Introduction

The FA-3300 series synchronous motor-driven, reversible, heavy duty actuators are available for 3-point (floating) or with electric positioner for 0…10 V or 0…20 mA control. They feature factory calibrated pressure switches to provide specified close-off ratings.

These actuators are available with 6000 N nominal force and can be used in combination with VG8000 and VBD series valves in accordance with the maximum close-off pressure ratings specified.

Factory fitted options, such as 2 kW feedback potentiometer and auxiliary switches are available. A hand wheel for manual positioning of the valve is standard on all models.

FA-3300 Actuator with VG8000 valve

Features and Benefits	
❑ **Uses synchronous motor with calibrated pressure limit switches.**	Constant running time. Fixed close-off force.
❑ **Special clamp coupler.**	Provides easy mounting of the actuator on valves with slotted stem.
❑ **Models for 3-point and proportional 0…10 V or 0…20 mA control.**	Allows optimum choice of electrical signal.
❑ **Positioner with adjustable starting point, span, and direct / reverse action.**	Provides flexibility in application. Allows easy sequencing from only one controller output signal.
❑ **Active 0…10 V position feedback on proportional models.**	Provides active signal for independent monitoring of position.
❑ **Optional auxiliary switches and feedback potentiometer available.**	Provides potential free contacts for independent monitoring of the actuator's position.
❑ **A hand wheel is standard on all models.**	Allows manual positioning independent from power supply.

Order No. 10.732 E

Ordering data

FA- □□**-741**□

Actuator Supply voltage*)

1	230 VAC, 50 Hz
6	24 VAC, 50 Hz

Accessories, factory mounted

00	None
03	Two auxiliary switches and 2 kΩ feedback pot.
04	135 Ω feedback pot.
41	Built-in electronic Positioner 0…10 V / 0…20 mA and two auxiliary Switches

*) For other supply voltage and frequency, please contact your Johnson Controls supplier.

Ordering Procedure

The valves and actuators can be ordered as separate units or a factory fitted combination. Should such a combination be required, please add "**+M**" after the order code for the actuator.

For example:

For a 2-way valve, DN 65, k_{VS} 63, PN16 plus actuator with electric positioner 0…10 V input, 24 V / 50 Hz supply, order:

Item 1 **VG82G1S1N** (valve body)
Item 2 **FA-3341-7416** (actuator)

Alternatively, to order a factory fitted combination:

Item 1 **VG82G1S1N** (valve body)
Item 2 **FA-3341-7416+M** (actuator)

Accessory Kits for in-situ installation:

EQ-1003-7101	Two Auxiliary Switches and Feedback Potentiometer 2 kΩ
EQ-1013-7101	Feedback Potentiometer 135 Ω

Repair parts:

EQ-1015-7101	Electric Positioner 0...10 V or 0...20 mA plug-in module for in-situ replacement.

Actuator-Valve combinations

The FA-3300 series heavy duty electric actuators are specifically designed to be used with the VG8000 and the VBD valve series. The ordering data for these valve bodies are as follows:

- **VG8000 series** (PN16 flanged valves)

VG82□□S1N	**2-way PDTC (NO)**	**DN 100…150**
VG88□□S1N	**3-way mixing**	**DN 100…150**
VG89□□S1N	**3-way diverting**	**DN 100…150**

- **VBD series** (PN25 flanged valves)

VBD-□□12-520□	**2-way PDTC (NO)**	**DN 80…150**
VBD-□□18-520□	**3-way mixing**	**DN 80…150**

Please refer to the product bulletins "VG8000 Series Flanged Valves" and "VBD Series Flanged valves" for complete ordering information.

Operation

3-point models

Connections	Actuator Stem
1-2	extends
1-3	retracts

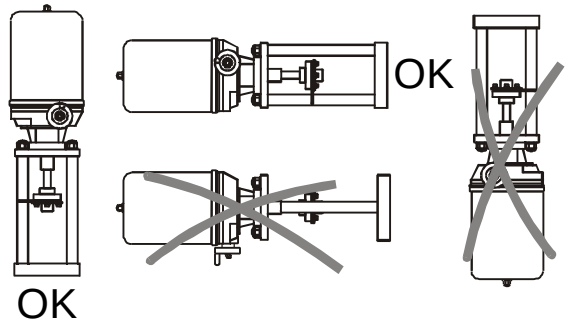
Proportional models

Action Jumper	Input control signal	Actuator Stem
Direct acting	increases	retracts
	decreases	extends
Reverse acting	increases	extends
	decreases	retracts

Mounting instructions

When mounting the actuator on a valve, please follow the instructions below:

- It is recommended that the valves be mounted in the upright position, in an easily accessible location. When mounted horizontally, the yoke should be fitted such that the stanchions are positioned vertically one above the other.



- The actuator must be protected against dripping water, which could enter the housing and damage the mechanism or motor.
- Do not cover with insulating material.
- Sufficient clearance must be allowed for actuator removal (refer to the dimension drawings).
- The valve must be installed so that the plug seats against the flow as indicated by the arrow(s) on the valve.

Wiring instructions

- All wiring must be in accordance with local regulations and national electrical codes and should be carried out by authorised personnel only.
- Make sure that the line power supply is in accordance with the power supply specified on the device.
- See also the instructions in paragraph “Application”.

WARNING

Shock Hazard

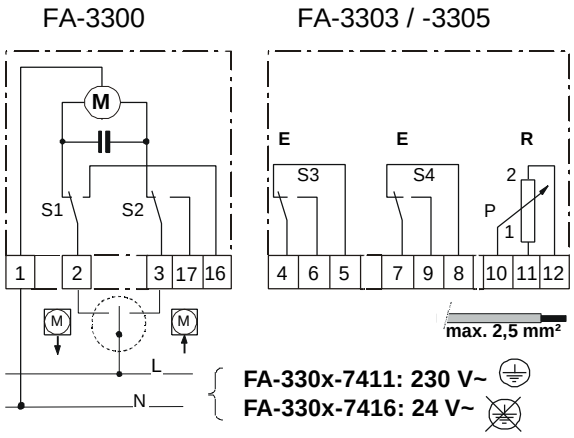
Disconnect the power supply before wiring connections are made to prevent personal injury.

Equipment Damage Hazard

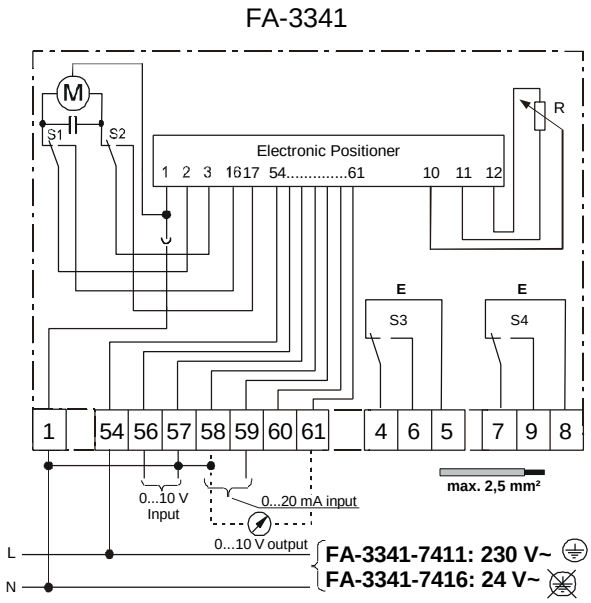
Make and check all wiring connections before applying power to the system. Short circuited or improperly connected wires may result in permanent damage to the unit.

Wiring diagrams

3-point models



Proportional models



Adjustments

WARNING

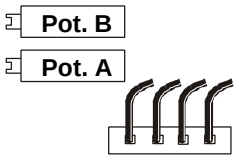
Shock Hazard

Great care must be taken when the cover is removed (by authorised personnel only) for adjustment or inspection.

In all other cases when the cover is removed the power must be switched off.

Do not touch or attempt to connect or disconnect wires when the electrical power is on.

Actuators with 0…10 V or 0…20 mA positioner (example below with 0…10 V)



Selecting positioner action:

The action can be selected by disconnecting plug "ST1", turning it 180 degrees and reconnecting it, as in the following illustration:

Direct Action

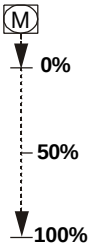
Reverse Action

Slope adjustment:

- **Direct Action**:

  At the **maximum** input signal, adjust the 0% position with "potentiometer A".

  At the **minimum** input signal, adjust the 100% position with "potentiometer B".



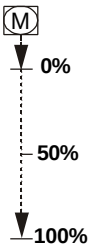
2…10 V Maximum input signal
Adjust with "pot.A".

0…8 V Minimum input signal
Adjust with "pot.B".

- **Reverse Action**

  At the **minimum** input signal, adjust the 0% position with "potentiometer A".

  At the **maximum** input signal, adjust the 100% position with "potentiometer B".



0…8 V Minimum input signal
Adjust with "pot.A".

2…10 V Maximum input signal
Adjust with "pot.B".

Note:

The maximum input signal must always exceed the minimum input signal by at least 2 Volts.

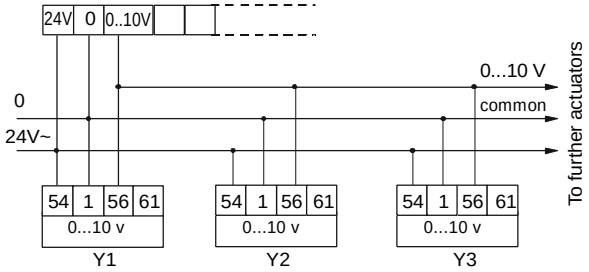
*A*pplications

Parallel and sequenced operation of actuators

CAUTION

Parallel connection is only possible using isolation relays. If the parallel running motors do not have separately switched power supplies one or more motors will start to cycle at the end of travel.

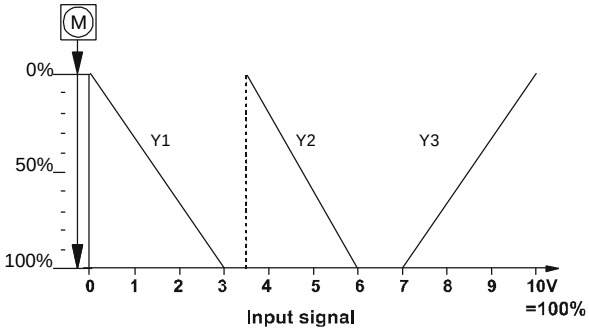
Actuators with built-in positioner for controllers with 0…10V output



Actuator with positioner
parallel and in sequence operation

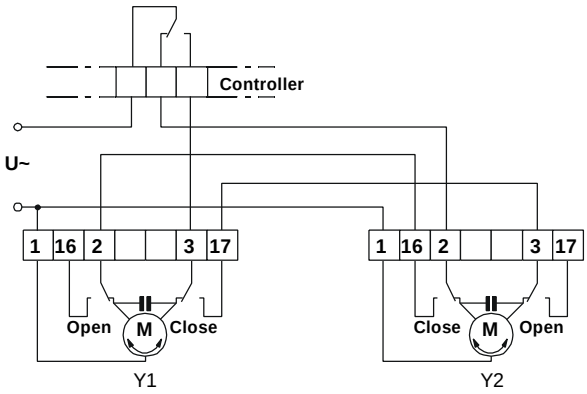
The controller output 0…10 V can operate several actuators with electronic positioner for 0…10 V or 0…20 mA control. The electrical wiring for parallel and sequenced operation is identical. The sequencing and action of the actuator can be adjusted individually on each positioner. Each positioner has its own adjustment for starting point between 0…8 V and end point between 2…10 V. Using the minimum adjustable span of 20 % therefore enables a maximum of 5 sequenced devices. Further sequencing can be accomplished by using additional controller outputs. Each positioner can be set for direct or reverse action.

Adjustments for Y1, Y2 and Y3 (example)



Reversible actuator without positioner for floating controller.

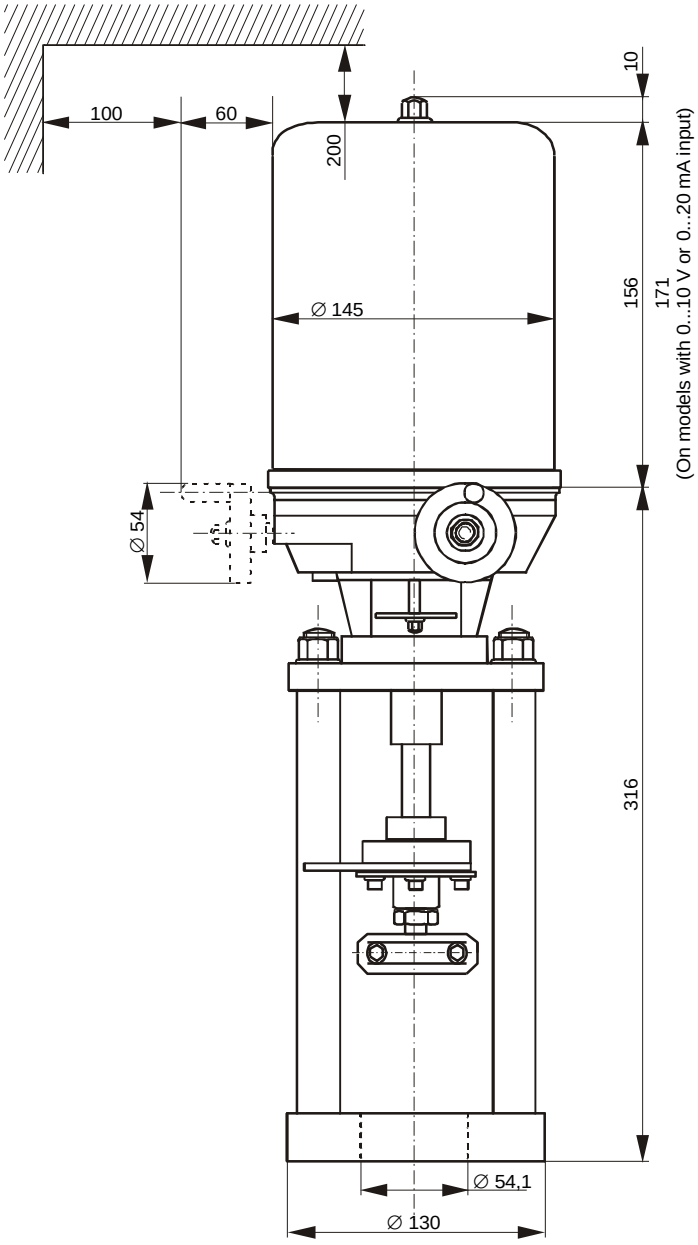
Sequencing two actuators without positioner using end switches.



Parallel operation of actuators without positioner with synchronous motor, condenser and end switches:

Although synchronous motors have the same running speed, deviation in travel between motors can accumulate because of varying load during start-stop operation. This deviation depends on the number of on/off cycles and is about 0,5 % per 100 cycles. Periodically switching the actuators to end of travel (e.g. normal position) will improve the synchronous running of the motors.

*D*imensions in mm



Specifications

Actuator models	FA-33xx-741x
Associated valve series and body sizes	• PN16: VG8000 DN 100...150 • PN25: VBD DN 80...150
Type of motor	Synchronous, Reversible
Action / Control	• 3-point • 3-point with 5(3) A / 250 VAC auxiliary switches and 2 kΩ or 135 Ω feedback potentiometer • Proportional with built-in 0…10 V or 0...20 mA electronic positioner (input impedance 10 kΩ) and with 5(3) A / 250 VAC auxiliary switches
Hand wheel	Standard on all models
Supply voltage and frequency*)	24 VAC +10% / -15%, 50 Hz 230 VAC +10% / -15%, 50 Hz
Power consumption (with positioner)	37 VA (42 VA)
Nominal force	6000 N + 300 N
Nominal stroke	42mm; Max. 45mm
Nominal running speed	17mm / min
Enclosure Protection	IP 65
Materials:	
Stem	Stainless steel (material DIN W-Nr. 1.4305)
Cover	Pressed sheet steel (lacquered)
Operating and Storage Conditions	-20...+60 °C R.H. 10…90 %, non condensing
Electrical Connection	screw connector 2,5 mm^2
Cable relief	1 x PG 11
Net weight	7,5 kg
Approvals	European Directives: EMC (89 / 336 / EEC) LVD (73 / 23 / EEC)

*) For other supply voltage and frequency, please contact your Johnson Controls supplier.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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Electric Valve Actuator FA-33xx-741x (FA42/6000) for VG8000 and VBD

General:

This service and data information (in brief SDI) is an operating instruction and comprises the prescribed instructions for safe installation and operation of the actuator FA-33xx-741x (FA42/6000). In the event of difficulties, which cannot be overcome with the aid of this SDI please consult the supplier.
This SDI conforms to the relevant and valid EN-safety standards and the appropriate ordinances and control references of the Federal Republic of Germany.
When operating the valve actuators outside the Federal Republic of Germany, it is the responsibility of the operator or plant planner to ensure that valid national control standards are met.
The manufacturer maintains all rights for technical changes and improvements at any time. Qualified personnel (see reference) is a prerequisite to the application of this SDI.
Operating personnel shall receive SDI instructions.

Qualified personnel:

These are persons conversant with installation, mounting, commissioning, operation and service of the product and in possession of the respective qualifications through their activities and functions, e.g.:

- Instructors with obligation to supervise adherence to all operative regional and internal ordinances and requirements.
- Trainers or instructors on safety standards, maintenance and utilisation of adequate safety- and protective operation equipment.
- Trainers in first aid, etc. (See TRB 700).

Application:

Electric actuators FA-33xx-741x (FA42/6000) can combined with the following valves:

VG8000	PN16, DN 100 to 150
VBD	PN25, DN 80 to 150

Danger:

Safe operation of the valve is only ensured if the valve is installed, commissioned and serviced by qualified personnel in compliance with warning references in this SDI. In addition, the general installation- and safety regulations for pipelines, installation construction and the professional use of tools and safety equipment must be guaranteed. Observe unconditionally during all work on the control valve. Ignoring this information may cause physical or material damages.

Storage:

- Storage temperature -40°C to +60°C, dry and free of dirt.
- Do not damage the lacquer. The lacquer is a foundation intended only as a protection against corrosion while in storage and during transport.
- In rooms where moisture or condensation are present use heating or a drying agent to maintain a moisture-free atmosphere.

Transport:

- Transport temperature -40°C to +60°C.
- Protect against external forces (shock, Vibration etc.).
- Do not damage the protective lacquer.

Actuator Installation site information:

The installation site should be easily accessible and provide sufficient room for service and removal of actuators. Manual shut-off valves should be located up and downstream of the control valve, to facilitate service and repairs without draining the piping system. The control valve should preferably be installed vertically with the actuator in the upright position. When carrying out inclined to horizontal installation of actuators the stanchions must be aligned vertically one above the other.

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Phone xx49 (0)201 / 2400-0

Pipelines should be insulated to protect actuators against high temperatures; here sufficient room is to be left for servicing the stem seal pack. For trouble free function of the control valve the pipe immediately upstream of the valve should be straight for the length of at least 2x DN and the pipe immediately downstream for the length of at least 6x DN.

Mounting and removal information:
The control valve is normally supplied complete with actuator. It is not permitted to remove or replace an actuator on systems in operation, under operating temperature and pressure. For conversion or service, The actuator mounting procedure should follow the actuator SDI. During mounting procedure the plug should NOT be rotated with downward pressure. Ensure adherence to max. valve operating forces for actuator replacement.

Actuator removal:
In addition to general mounting guidelines and TRB 700 the following points should be observed:

- Pressure free piping system
- Cooled fluid
- Drained piping system
- With corrosive or aggressive fluids the piping system should be vented.
- Work to be performed by qualified personnel only.

Caution:
Electrical wiring must be in conformance with directives for high-voltage installations; voltage supply and frequency must be identical with data on the product nameplate.

Voltage supply line wiring:
Wire gauge min. 1mm^2.

Voltage supply line fuse:
max. 6 A, 2 A at 24V, observe DIN VDE 116!

Electrical isolation:
Prior to the removal of the actuator cover, e.g. for mechanical maintenance and adjustment, line voltage supply must be disconnected by means of an isolation switch, safeguarded against inadvertent operation.

Electrical connection:

- Select gland size of PG screw fitting, to DIN 46320, to match cable diameter.
- Lead cable through the PG screw fitting to the respective terminals, and then remove insulation from wire tips. Inside the actuator, wires must be routed or fastened so that they are protected against damage by moving or rotating parts and removal or replacement of the actuator cover.
- Fasten ground wire to ground terminal. (Not applicable for 24V version)
- Tighten PG screw fitting to achieve a reliable strain relief.

Mounting of accessories: E, R2 (R135) and ER2
Installation and test are to be in accordance with accessory by-pack instructions.

Technical data:

Electrical connection:
Terminal strip via 2 PG 9/11 cable connectors
PG 9 plugs

Operating voltage:
230V / 50Hz + 10% / - 15%
24V / 50Hz + 10% / - 15%
(60Hz Model on request)

Limit switches:
2 pressure switches max. 250V AC

Permissible ambient temperature:
-20°C to +60°C

Operating force:
6000 N + 300N

Manual operation:
Side-mounted hand wheel

Stroke timing:
17mm/min., equates 148sec. for 42mm stroke

Power consumption:
37VA + 5VA with positioner

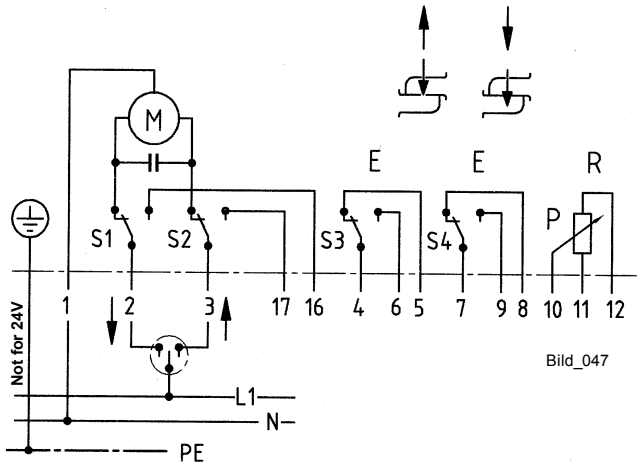
Nominal stroke:
42mm max. 45mm

Enclosure to DIN 40050:
IP 65

Accessories (installable in-situ):
E = 2 limit switches, max. 250V AC
Resistive load max. 5A
Inductive load max. 3A
Light bulb max. 3A
R2 = feedback potentiometer 2 kΩ
R135 = feedback potentiometer 135 Ω

Positioner:
0-10V (0-20mA) Control

Wiring diagram:
Version with limit switches and feedback potentiometer



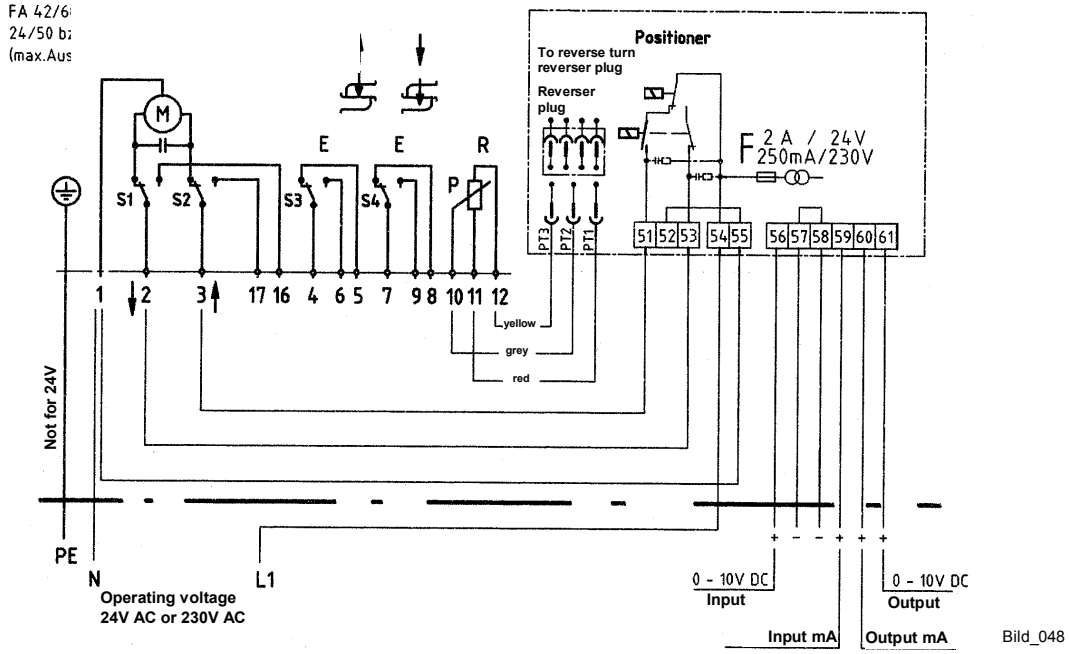
Observe following requirements:

Voltage on terminals 1 and 2: Actuator stem extends
Voltage on terminals 1 and 3: Actuator stem retracts

Version with feedback potentiometer:

When the actuator stem is fully extended, (terminals 1 and 2), nominal potentiometer resistance can be measured between terminals 10 and 12.

Wiring diagram:
Version with positioner and limit switches



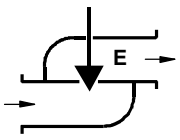
Observe following requirement:

For
- 24V AC respectively 230V AC operating voltage
- 0V DC on terminal 56
- Action mode: “direct acting” (DA)

Actuator stem must extend!

Mounting orientation:
It is recommended that the valves be mounted upright in an easily accessible location. When mounted horizontally, the yoke should be fitted such that the stanchions are positioned vertically, one above the other

Two-way PDTC

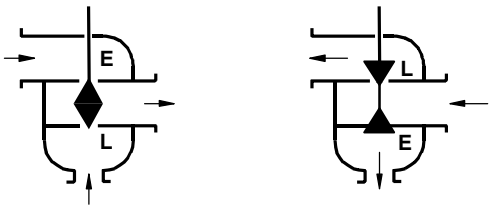


For the flow direction the following is valid:

Valve plug close-off movement must always be directed against flow. This requirement is fulfilled if the valve is installed in arrow-direction. (See symbols on valve body)

Equal-linear - Mixing

Linear-equal Diverting



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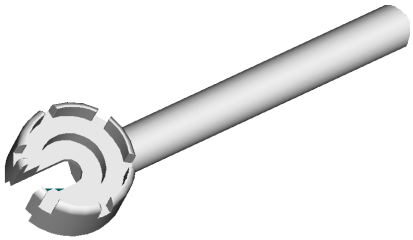
Close-off pressures:

Valve series	Stroke	Nominal size / kvs	Close-off pressure (kPa)
VG8000, PN16	42 mm	DN 100/160 DN 125/250 DN 150/350	740 460 280
VBD, PN25	42 mm	DN 80/100 DN 100/160 DN 125/250 DN 150/360	950 570 330 210

Caution: The heating system should only be pressurised when the valve is fully open!

Tool for fitting the ring nut (order No.: 111 6235 010)



Device code:

F	A	-	3	3			-	7	4	1	

Voltage / Frequency
1 = 230 V, 50 Hz
6 = 24 V, 50 Hz

Accessories
00 = None
01 = Limit switch
02 = 2kΩ feedback potentiometer
03 = Limit switch and 2kΩ feedback pot.
04 = 135Ω feedback potentiometer
40 = 0-10V pcb
41 = 0-10V-, E pcb

Connection and mounting
(When supplied individually)

Valve:

Push valve stem to lowest position.
Caution: Valve stem rotation may damage valve seat!

Actuator:

- Screw nut on to stem extension and screw as far as possible into the actuator coupling.
- Electrically connect actuator and drive to mounting position 106mm. For model with positioner, adjust potentiometer “B” to achieve mounting position, if necessary.
- Place the ring nut with the machined surface downward, onto the valve crossbar.
- Place the actuator completely onto the valve and align (the stanchions of the yoke must be aligned in the direction of flow when the actuator is mounted in the upright position. When mounted in the horizontal the stanchions must be aligned vertically, one above the other.). Tighten the ring nut.
- Screw out the stem extension until it abuts the valve stem thereby observing the position of the spanner gripping surfaces.
- Fit the coupling halves and counter lock the M14 nut against the coupler
- Fix the stroke indication plate.

Valve actuator with positioner:

- Should the actuator stem retract automatically with power on, disconnect electrically and rotate reverser plug ”ST1” 180° (RA for reverse- and DA for direct action) then re-connect the actuator.
- The (0…10V DC) control signal to the actuator is connected to terminal 56 (pos.) and terminal 57 (neg.)

Setting the sequence range: factory setting 0-10V DC

The positioner can be driven within the sequence range. Any sequence position can be taken up within the maximum ranges of 0…10V DC but the sequence may not fall below 2V.

- Connect the voltmeter to terminal 61 (pos.) and terminal 58 (neg.). The *actual set point* will be displayed on the volt meter
- Set the desired upper reference set point and wait until the actuator is at rest.
- Retract the actuator stem by turning potentiometer “A” until switch “S2” is operated (check continuity between terminal 17 and terminal 3) and the difference between the actual set point and the reference set point is lesser 0.3V DC
  Settings should be carried out in the smallest possible steps and always wait until the actuator is at rest
- Set the desired lower reference set point and wait until the actuator is at rest.
- Retract the actuator stem by turning potentiometer “B” until switch “S1” is operated (check continuity between terminal 16 and terminal 2) and the difference between the actual set point and the reference set point is lesser 0.3V DC.
  Settings should be carried out in the smallest possible steps and always wait until the actuator is at rest
- To test, first set the upper and then the lower reference set points each time waiting until the actuator is at rest before taking readings of continuity between terminal 17 and 3 and also terminal 16 and 2 respectively

Note!

Switches “S1” and “S2” must be operated when the actuator is driven to upper and lower end position by means of electronic positioning, this can be verified by measuring continuity between respective terminals.

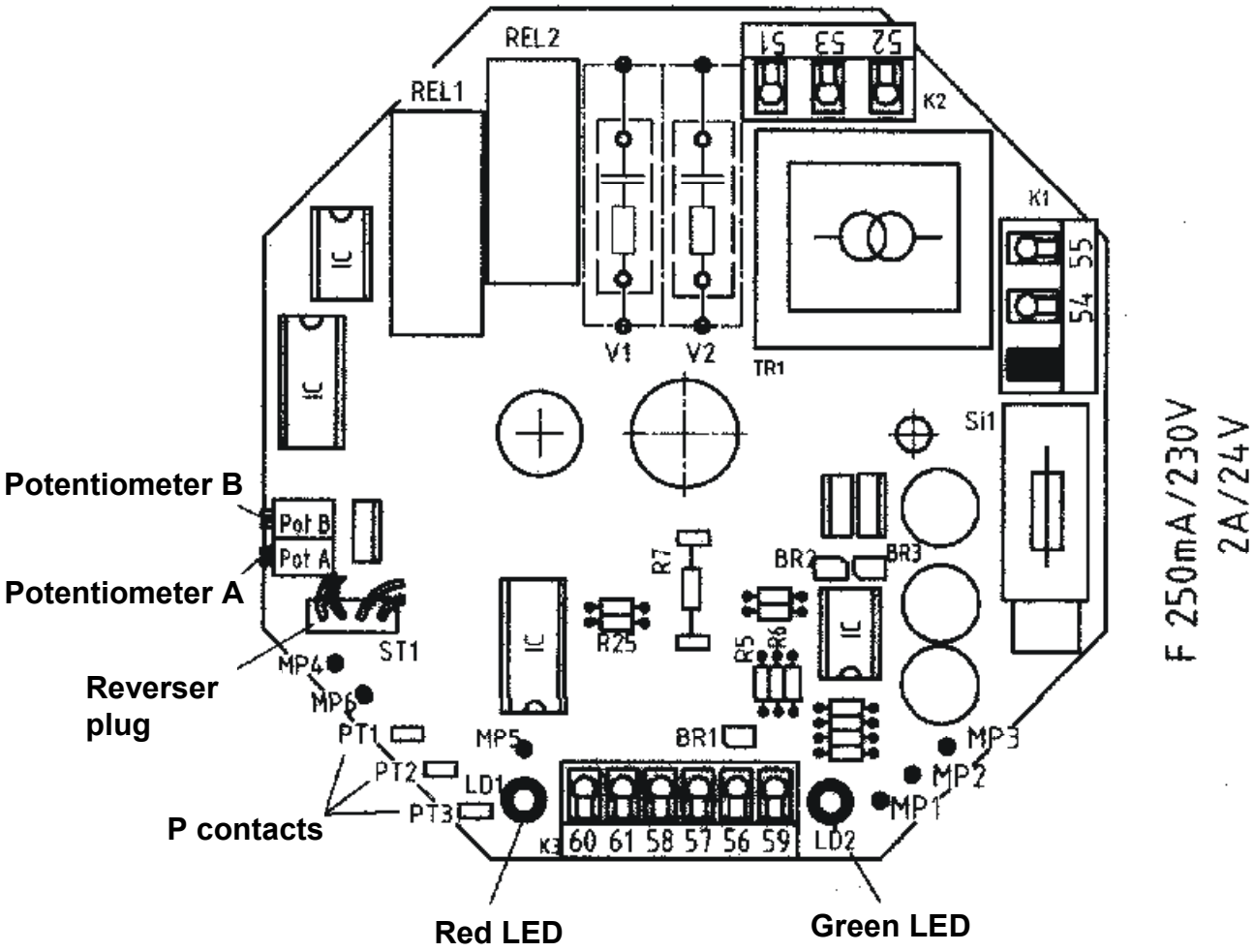
Tolerance between actual voltage reading and the reference setting is 0.3V DC. Feedback is not potentially separated from input. The light emitting diodes (LED’s) facilitate limit-switching adjustment especially for sequence of operation. The red LED is illuminated when actuator stops. The green LED is illuminated when actuator is in operation and also when the limit switches have been operated (this gives assurance that the end position has been achieved).

Adjustment example: Actuation 0-10V DC, DA

Adjust input signal to 10V DC. Actuator moves to upper position. Adjust potentiometer “A” until switch “S2” is tripped and feedback indicates ≥9.7V DC.
Adjust input signal to 0V DC. Actuator moves to lower position. Adjust potentiometer “B” until switch “S1” is tripped and feedback indicates ≥0.3V DC.

Adjustment example: Actuation 4-6V DC, DA

Adjust input signal to 6V DC. Actuator moves to upper position. Adjust potentiometer “A” until switch “S2” is tripped and feedback indicates ≥5.7V DC.
Adjust input signal to 0V DC. Actuator moves to lower position. Adjust potentiometer “B” until switch “S1” is tripped and feedback indicates ≥4.3V DC.



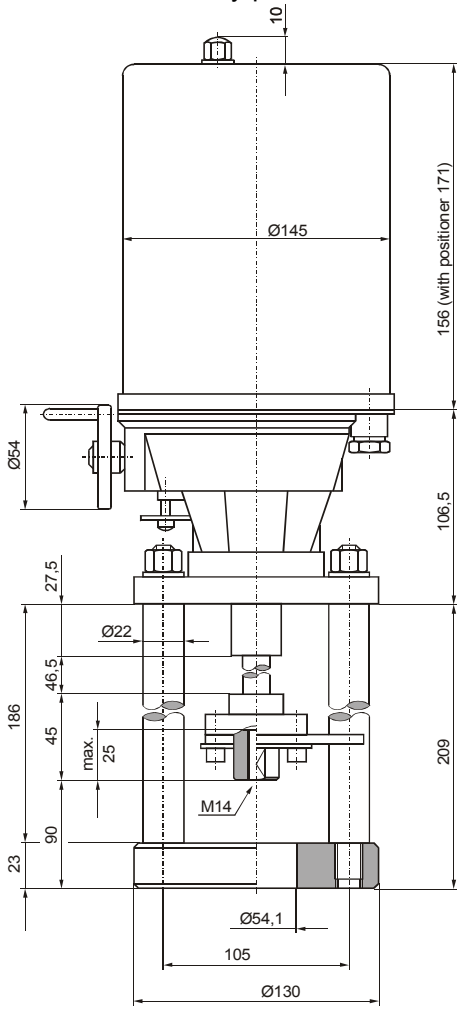
The deviation between input signal and feedback is intentional to ensure that actuator force is available in end positions and limit switches “S1” and “S2” switch off the actuator.
With adjustment completed, fix stroke indicator scale to actuator yoke rod. Stroke start or end, (depending on actuation mode) is the rotation lock.

Accessories / Repair kits for FA-33xx-741x (FA42/6000)

Order Code	Prefix	Description	Remarks
EQ-1020-7101	E	Remote position feed back assembly with 2 limit switches	Not for EPOS model
EQ-1021-7101	R2	Remote position feed back assembly fitted with (1) 2 kΩ potentiometer	Not for EPOS model
EQ-1022-7101	ER2	Remote position feed back assembly with 2 limit switches and (1) 2 kΩ potentiometer	Not for EPOS model
EQ-1023-7101	R135	Remote position feed back assembly fitted with (1) 135 Ω potentiometer	Not for EPOS model
EQ-1024-7101		2 limit switches, for actuator with remote position feed back assembly as standard	
EQ-1025-7101		2 kΩ Potentiometer for actuator with remote position feed back assembly as standard.	Not for EPOS model
EQ-1026-7101		135 Ω Potentiometer for actuator with remote position feed back assembly as standard	Not for EPOS model
EQ-1027-7101		Remote position feed back assembly without limit switches and potentiometer	Not for EPOS model
EQ-1028-7101		Replacement pcb (FA42/6000 only)	

Valve series VG8000: Service and data information, SDI 121 4349 050 is included in the valve by-pack.

SDI 121 4349 050 for the VG8000N series is a valve by-pack.
SDI 121 4612 050 for the VG8000V series is a valve by-pack.



DECLARATION OF CONFORMITY

We

Johnson Controls
JCI-Regelungstechnik GmbH
Westendhof 8
D-45143 Essen

declare under our sole responsibility that the product

Electrical actuator:

FA-33xx-741x (FA42/6000)

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

EN 50081-1; EN 50082-1; EN 60335-1

Following the provisions of Directive(s)

EMV directive 89/336/EEC
Amendment 91/263/EEC, Amendment 92/31/EEC, Amendment 93/68/EEC, Amendment 93/97/EEC

Low voltage directive 73/23/EEC
Amendment 93/68/EEC

D-45143 Essen, 12.01.2000

W. Tessmer (Managing Director)