

### ROTARY ACTUATORS

The 'AR' range of reversing actuators have a rotary output for coupling to air dampers or rotary valves requiring a rotary drive through approximately 95°. Models are available for mains voltage, 24Vac and 0 to 10Vdc. All can be used for either modulating or ON/OFF control depending on the control signal supplied to the actuator.

The 'AR' actuators are supplied with the stroke limiter required to prevent the fully-open and fully-closed positions being achieved.



### FEATURES

- Compact size
- Hollow actuator drive output shaft accommodates any length of damper shaft without the need to cut it
- Simple to install, most dampers do not require universal joints or rods
- Accommodates shaft diameters from 10 to 20mm and square shafts from 10 to 16mm square
- Single socket screw fitting to damper shaft
- Stroke limiter supplied with the actuator
- 1.5 metre fly lead supplied for electrical connections (terminals and/or conduit entry may be used if required)
- Complies with all relevant EC directives for EMC and electrical safety
- Double insulated, no earth required
- Case sealed to IP 54 reduces ingress of dust and moisture
- Tamper resistant settings and wiring
- Actuators can be connected in parallel
- Comprehensive range of accessories and linkages available
- 0-10V Feedback signal for monitoring the actual actuator position via BMS (ARE2304, 2354 only)



Multi-Lingual Instructions  
MLI 3.215 - Installation Instructions



## SPECIFICATION

Order Type	ARX2202 ARX2203		ARX2252 ARX2253		ARE2302 ARE2303 ARE2304		ARE2352 ARE2354 ARE2355		ARM2606* ARM2607*		ARM2656* ARM2657*	
Power Supply	24Vac ±10%, 50/60Hz		24Vac ±10%, 50/60Hz		24Vac ±10%, 50/60Hz		24Vac ±10%, 50/60Hz		230Vac ±10%, 50/60Hz		230Vac ±10%, 50/60Hz	
Consumption	6.5VA		6.5VA		11VA		11VA		7.5VA		7.5VA	
Input Control Signal (for modulation)	Pulsed 24Vac		Pulsed 24Vac		0-10Vdc		0-10Vdc		Pulsed 230Vac		Pulsed 230Vac	
Starting and Running Torque	15Nm		8Nm		15Nm		8Nm		15Nm		8Nm	
Holding Torque	5Nm		3Nm		5Nm		3Nm		5Nm		3Nm	
Start & Span	ARX2202 ARX2203	X X	ARX2252 ARX2253	X X	ARE2302 ARE2303 ARE2304	X ✓ ✓	ARE2352 ARE2355 ARE2354	X X ✓	ARM2606 ARM2607	X X	ARM2656 ARM2657	X X
Auxiliary Switches	ARX2202 ARX2203	X ✓	ARX2252 ARX2253	X ✓	ARE2302 ARE2303 ARE2304	X X ✓	ARE2352 ARE2355 ARE2354	X ✓ ✓	ARM2606 ARM2607	X ✓	ARM2656 ARM2657	X ✓

\* ARM2606,7 and ARM2656,7 are not compatible with CMC or CSMC controllers (all models).

<b>Action:</b>	Reversing – modulating
<b>Stroke Time:</b>	90 to 220s
<b>Angular Stroke:</b>	95°
<b>End of Stroke Limits:</b>	By stalling against the mechanical stops. A stroke limiter is provided for dampers requiring less than 90° of stroke. Motor stops running when stalled.
<b>Maximum Ambient Temperature:</b>	Operating: -20 to +50°C Storage and Transit: -40 to +70°C
<b>Limiting Stroke:</b>	A stroke limiter is included to limit the stroke so that the actuator does not either fully open or fully close. The use of the stroke limiter is optional.

## CONSTRUCTION

<b>Case:</b>	Glass reinforced polyarylamide. Fire resistant to UL94V-0.
<b>Protection Class:</b>	IP 54
<b>Wiring Entries:</b>	One or two PG 13.5 glands, factory fitted. One PG 13.5 gland is used by the motor fly lead. Another entry can be used for the auxiliary switch fly lead.
<b>Terminals:</b>	1.5m fly lead routed through a PG 13.5 gland nut.
<b>Number of Cores:</b>	<b>ARX, ARM:</b> 3 cores <b>ARE2304, 2354:</b> 4 cores (1 extra for 0-10V output) <b>Auxiliary Switch:</b> 6 cores
<b>Mounting Attitude:</b>	Any position, but not below the valve or damper.
<b>Position Indicator:</b>	Marked 0 to 10 representing 0 to 100% of the actuator stroke.
<b>Manual Operation:</b>	A push button disengages the gear train so that the controlled device may be manually positioned. <b>WARNING - ALWAYS TAKE CARE, WHEN MANUALLY POSITIONING A VALVE OR DAMPER, TO AVOID TRAPPING FINGERS ETC.</b>
<b>Shaft Connection:</b>	Accommodates shaft diameters from 10 to 20mm and square shafts from 10 to 16mm square. Secured by a single M8 socket head screw. Minimum shaft length of 20mm.

## ACCESSORIES

<b>Linkage Kit</b>	
<b>MBF 3 port flanged valves 65 to 100mm:</b>	<b>LK2701</b>
Used to fit the AR Mk 2 actuator to the MBF rotary shoe valve which includes a manual override lever.	
<b>MB 3 port Screwed valves ½" to 2":</b>	<b>LK2702</b>
Used to fit the AR Mk 2 actuator to the MB rotary shoe valve.	
<b>Traditional connection to damper boxes:</b>	<b>LK2407</b>
Bracket, output shaft, crank arm and universal couplings for traditional damper mounting. An 8mm diameter connection rod is also required, not supplied.	
<b>Direct Damper Mounting Kit:</b>	<b>LK2408</b>
Adjustable anti-rotation strip for fitting the AR onto damper shafts allowing the AR to move in relation to the damper position.	

# INSTALLATION

## LOCATION

Select a location that is reasonably clean and free from damp and condensation.

## WARNINGS -

**STEAM OR HOT WATER HAZARD. BEFORE REMOVING ACTUATOR FROM VALVE OR OPENING VALVE, ENSURE THAT THE VALVE CONTROL MEDIUM IS ISOLATED AND RELIEVE THE PRESSURE. WORK SHOULD ONLY BE CARRIED OUT BY A COMPETENT ENGINEER.**

**DO NOT SWITCH ON POWER UNTIL THE COMMISSIONING STEPS HAVE BEEN COMPLETED.**

**ALWAYS TAKE CARE WHEN MANUALLY POSITIONING A VALVE OR DAMPER TO AVOID TRAPPING FINGERS ETC.**

1. Check the location has adequate access for fitting and wiring. If you need to open the actuator e.g. setting an ARE, then allow enough access to remove the lid and work on the actuator.
2. Ambient temperature limits  $-20^{\circ}$  to  $+50^{\circ}\text{C}$ .
3. The actuator may be mounted in any attitude as long as it is not beneath the valve or damper as this presents a risk of condensation dripping down the shaft and onto the actuator. There must be NO angle between the actuator and the damper/valve shaft.
4. For mounting on MBF valves and traditional damper fixing please refer to DS 5.001.

## FITTING STROKE LIMITER SUPPLIED (OPTIONAL)

The stroke limiter packed with this linkage kit is optional and is used for the following reasons:

- To limit either the opening or closing of a damper, e.g. minimum fresh air.
- To limit travel when a damper runs through less than  $95^{\circ}$  and stalling against the damper end stop could cause damage to the damper. This may for instance be required on lightweight dampers.

The limiter is adjustable in  $10^{\circ}$  steps.

1. Unscrew the M8 socket screw from the actuator (Fig.1).
2. Move the actuator to the position that it is to stop at and drop the stroke limiter on to the output shaft of the actuator so that the straight edge butts up against the flat of the actuator. This will prevent the shaft turning any further and thus limit the stroke.
3. Push the limiter down firmly matching up the shaft and limiter serrations. Now fit the plastic retaining clip into the actuator output shaft slot.
4. Refit the M8 socket screw.

## DIRECT CONNECTION TO DAMPER BOX USING KIT SUPPLIED

1. Follow the instructions given for location.
2. The actuator will fit damper shafts of 10 to 20mm diameter and 10 to 16mm square with either the flat or corners of the damper shaft in line with the damper blades. The minimum damper shaft length is 20mm, there is no maximum length.

## WARNING -

**ALWAYS TAKE CARE, WHEN MANUALLY POSITIONING A VALVE OR DAMPER, TO AVOID TRAPPING FINGERS ETC.**

3. According to the direction of damper rotation, manually close the damper. Disengage the actuator drive by depressing the manual operation button and use the M8 socket head screw to manually move the actuator to the closed position (0 or 10 on the actuator scale depending on damper rotation direction).

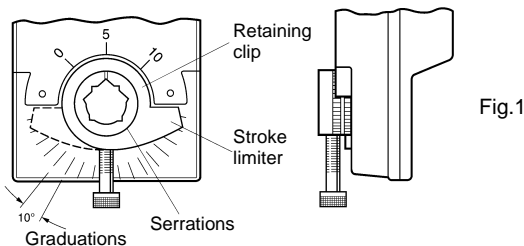


Fig.1

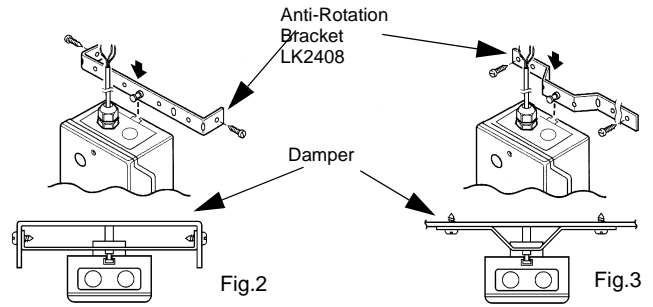


Fig.2

Fig.3

## DIRECT DAMPER BOX MOUNTING TO DAMPERS WITH FLANGES USING ANTI-ROTATION BRACKET (LK2408).

1. Measure the width between the damper flanges and cut or bend an equal amount on either side of the location pin on the anti-rotation bracket, as appropriate, to fit the damper. For less than 200mm see Fig.2. For greater than 200mm, see Fig.3.
2. Slide the location pin into the slot moulded in the actuator base and secure to the damper frame with screws. Ensure that the actuator has some axial movement to accommodate different damper shaft sizes.
3. Move on to 'Direct Connection For All Dampers'.

## DIRECT CONNECTION FOR ALL DAMPERS

1. Tighten the M8 socket screw securely on to the damper shaft.
2. Check that the actuator and damper run over the full range required depressing the manual override button and rotating the M8 socket head screw. If either do not run through the full travel, release the socket screw, move the actuator/damper to obtain the correct travel and re-test. Release the override button once satisfied with the travel.

## INSTALLATION (CONTINUED)

### SETTING AUXILIARY SWITCH CAMS (where fitted)

#### Caution

When switching auxiliary loads e.g. boiler, fan or pump, the use of auxiliary switches is strongly recommended to ensure that the valve/damper is fully open when the load is energised.

#### WARNING -

**AUXILIARY SWITCHES WHEN FITTED, AND ARM ACTUATORS ARE AT MAINS POTENTIAL. OBSERVE LOCAL WIRING REGULATIONS, EARTHING REQUIREMENTS AND ALL USUAL SAFETY PRECAUTIONS.**

1. Isolate power supply to the actuator and feeds to the auxiliary switches.
2. Remove actuator cover by first removing the 3 cross head screws.
3. Set the actuator to mid stroke (position 5) by using the manual override button. Release the button.
4. Slide the cam along the slot so that the arrow is set to the required switching position. The actuator is marked from 0 to 45° and 45 to 90° to make switch setting simple (Fig.4). Tighten the screw to fix the cam in position.
5. Repeat the operation for the other switching cam.

Note: When retrofitting a Mark 2 'AR' actuator in place of an existing Satchwell actuator the switch operation of contacts S4, S5 and S6 will be reversed. i.e. at the point of operation the switch contacts will change over from S4 and S6 to S4 and S5. Switch contacts S1, S2 and S3 remain as before.

6. Replace cover and fixing screws.

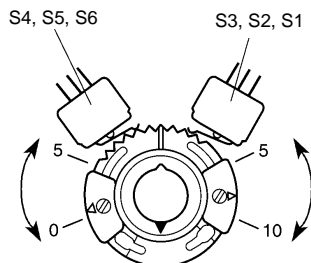


Fig.4

ARX2203, 2253  
ARE2304, 2354, 2355  
ARM2607, 2657

## WIRING

#### WARNING -

**AUXILIARY SWITCHES WHEN FITTED, AND ARM ACTUATORS ARE AT MAINS POTENTIAL. OBSERVE LOCAL WIRING REGULATIONS, EARTHING REQUIREMENTS AND ALL USUAL SAFETY PRECAUTIONS.**

1. Connect the actuator fly lead as detailed in the appropriate wiring diagram or system diagram.

## COMMISSIONING

1. Check that all control equipment is correctly located and fitted.
2. Check ambient temperature conditions are correct (-20 to +50°C).
3. Check the stroke is set within the specified limits for the damper.
4. Check that the actuator can be manually moved through the desired range without locking up or binding.
5. Check that the actuator has been correctly mounted according to the installation instructions and that all electrical connections are routed clear of the actuator linkage.
6. Check the control circuit wiring is correct and in accordance with the overall control system wiring diagram.
7. Switch on the power supply and check that the actuator and damper go through their full travel without locking up as this will cause damage.

# OPERATION AND ADJUSTMENTS (ARE2303,2304)

Adjustment:	Marked:	Function:	Factory set at:
SLIDE SWITCH	'⊕' / '⊖'	Selects direct or reverse action. + signifies increase of actuator position with increasing input signal (Vdc). - signifies the reverse of this.	⊕
POTENTIOMETER	'Start' 0-10V	Sets the command signal voltage at which the actuator commences to move from zero position.	0V
POTENTIOMETER	'Span' 4-10V	Sets the change in command signal voltage which will cause actuator to move through complete stroke to position 10.	10V

## Actuator positions for various signal voltages at different settings

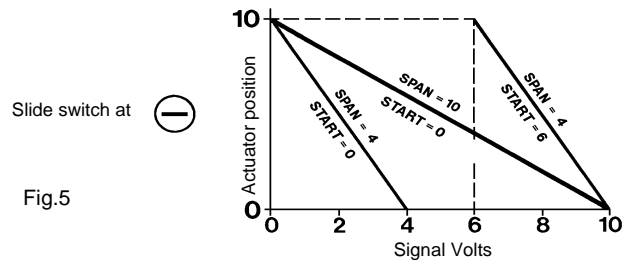
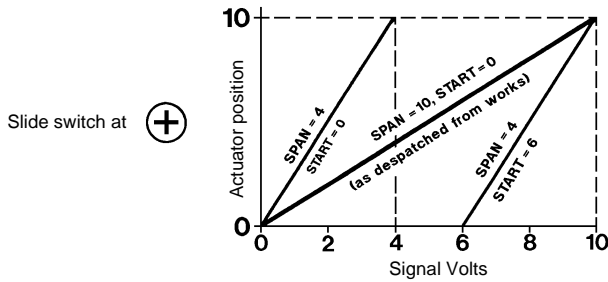


Fig.5

## CONNECTION DIAGRAMS

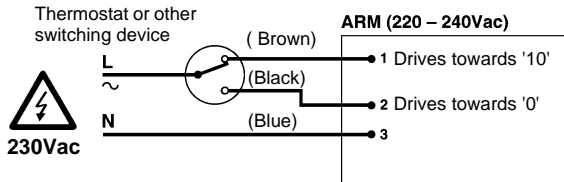
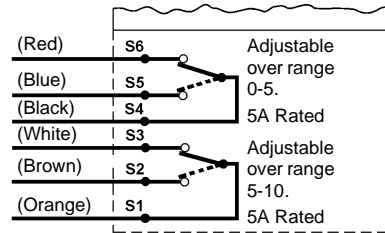


Fig.6

**Caution**  
ARM2606,7 and ARM2656,7 are not compatible with CMC or CSMC controllers (all models).

S4 makes to S5 at '0' or set position  
S1 makes to S2 at '10' or set position



**230Vac**  
Auxiliary Switches

Fig.9

**Caution**  
When switching auxiliary loads e.g. boiler, fan or pump, the use of auxiliary switches is strongly recommended to ensure that the valve/damper is fully open when the load is energised.

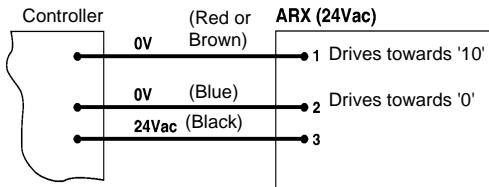
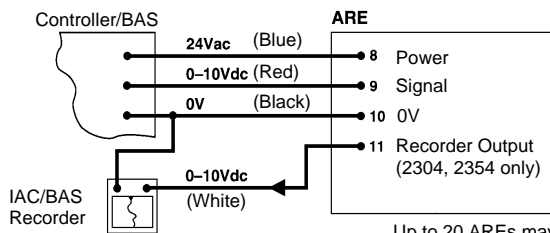


Fig.7

## POWER VIA CONTROLLER



### POWERED FROM SEPARATE TRANSFORMER

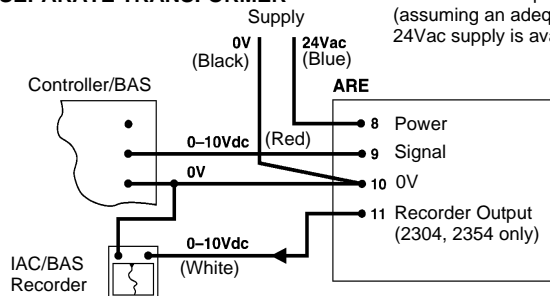
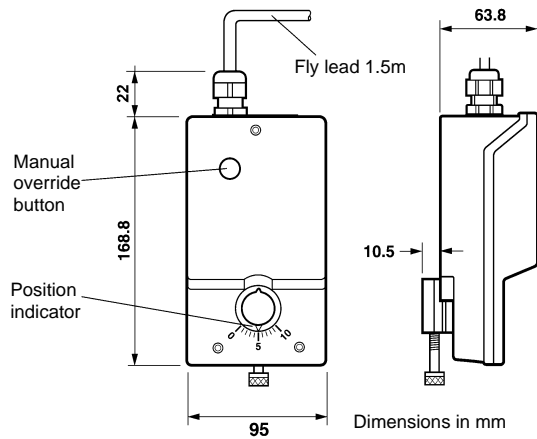


Fig.8

Up to 20 AREs may be connected in parallel to the same 0-10Vdc input signal (assuming an adequate 24Vac supply is available).

## DIMENSION DRAWINGS



## WIRING PRECAUTIONS

Actuator Type	Wiring from actuator to controller <sup>a</sup>	Max. length of 1.5mm <sup>2</sup> cable unscreened	Max. resistance per conductor
ARX/ARM	Supply	100m	5Ω
ARE	24Vac Supply	100m	3Ω
	0 to 10Vdc Signal	100m	50Ω

a When wiring to BAS outstations refer to the appropriate outstation data sheet for wiring precautions

### WARNING -

**AUXILIARY SWITCHES (WHEN FITTED) AND ARM ACTUATORS ARE AT MAINS POTENTIAL. OBSERVE LOCAL WIRING REGULATIONS, EARTHING REQUIREMENTS AND ALL USUAL SAFETY PRECAUTIONS.**

When working on actuators containing mains voltages, ensure that they are fully isolated. Mains voltage isolators must conform to EN 60335-1.

For longer lengths, up to 300m, increase the cable size and observe the maximum resistance also screen wiring and earth screen at the controller only.

ARM, ARX or ARE actuators can be connected in parallel.

24Vac devices must be supplied by a transformer conforming to EN 61558.

### WARNINGS -

**STEAM OR HOT WATER HAZARD. BEFORE REMOVING ACTUATOR FROM VALVE OR OPENING VALVE, ENSURE THAT THE VALVE CONTROL MEDIUM IS ISOLATED AND RELIEVE THE PRESSURE. WORK SHOULD ONLY BE CARRIED OUT BY A COMPETENT ENGINEER.**

**CERTAIN MODELS (AND AUXILIARY SWITCHES WHERE FITTED) ARE AT MAINS POTENTIAL. LOCAL WIRING PRECAUTIONS AND USUAL SAFETY PRECAUTIONS MUST BE OBSERVED. NOTE EARTHING REQUIREMENTS.**

**CARE SHOULD BE TAKEN WHEN MANUALLY MOVING THE DAMPER.**

#### Cautions

- Do not apply any voltages until a qualified technician has checked the system and the commissioning procedures have been completed.
- ARM2606,7 and ARM2656,7 are not compatible with CMC or CSMC controllers (all models).
- 24Vac devices must be supplied by a transformer conforming to EN 61558.
- When switching auxiliary loads e.g. boiler, fan or pump, the use of auxiliary switches is strongly recommended to ensure that the valve/damper is fully open when the load is energised.
- Mains voltage isolators must conform to EN 60335-1.
- Observe wiring precautions on Page 6.
- Observe installation instructions on Page 3.
- Ensure wires are not inadvertently crossed over. Wiring errors not only cause malfunctions; they may also damage controllers and/or actuators.
- Observe maximum and minimum ambient temperatures.
- Check maximum torque of the actuator is sufficient to drive the damper at the maximum air flow of the system. Do not exceed maximum actuator torque.
- Interference with parts under sealed covers invalidates the guarantee.
- Design and performance of TAC Satchwell equipment is subject to improvement and therefore liable to alteration without notice.
- Information is given for guidance only and TAC Satchwell does not accept responsibility for the selection and installation of its products unless information has been given by the Company in writing relating to a specific application.
- A periodic system and tuning check of the control system is recommended. Please contact your local sales office for details.

Copyright © 2006, TAC AB  
All brand names, trademarks and registered trademarks are the property of their respective owners. Information contained within this document is subject to change without notice. All rights reserved.

DS 3.215 03/06



**TAC Headquarters**  
Malmö, Sweden  
+46 40 38 68 50

**Satchwell Helpline**  
+44 (0) 1753 611000  
satchwell.info@uk.tac.com

[www.tac.com](http://www.tac.com)

