INSTALLATION AND MAINTENANCE MANUAL
ISOTHERMIC HUMIDIFIERS
BY DRY STEAM INJECTION
DIPHUSAIR-MT2

MMT2-EN-22-0

In compliance with the Rules and Standards of the European Union on Machine Safety, it is essential to read this protocol carefully before installing any equipment.

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ANEX: ACTUATORS TECHNICAL INFORMATION

- **I. Schneider MS51-7103-150 & MS51-7103-160**
- **II. Actuador Siemens SKD62 & SKB62**
- **III. Actuador Spirax AEL3E**

Threaded industrial valve→ Schneider MS51-7103-150 & MS51-7103-160 actuators

Threaded hygienic valve→ Schneider MS51-7103-150 & MS51-7103-160 actuators

Flanged industrial valve→ Siemens SKD62 & SKB62 actuators

Flanged hygienic valve→ Spirax AEL3E actuator

1 Introduction

Dear Customer,

The DIPHUSAIR humidifier is our answer to current technical needs, due to its safe operation, its operational convenience and economic efficiency.

To ensure effective operation of your DIPHUSAIR humidifier, please read the Installation, Operation and Maintenance Instructions.

Use the steam humidifier only in appropriate and safe conditions, while paying attention to all the notes in these instructions.

If you have any questions... Please contact us:

FISAIR, S.L.U.
Tel.: (34) 916.921.514
Fax: (34) 916.916.456
www.fisair.com/contact

Or contact your local distributor.

1.1 Operation instructions

The correct use of the humidifier includes following our instructions for installation, set-up, operation and maintenance, as well as following the steps indicated in the instructions in the correct sequence as described.

This humidifier may only be used by persons who are fully qualified and authorized to do so.

Any person who transports and/or used the unit or who works with it must read and understand the relevant section of this manual, in particular the section entitled "Safety Instructions".

You are advised to keep a copy of the user manual in the place where the humidifier is going to operate (or nearby).

Ignoring these instructions may invalidate all applicable guarantees and warranties.

2 Safety Instructions

FISAIR disclaims any liability if not all the installation and operating instructions it has provided are complied with; if the products have been modified or altered without the written consent of FISAIR; or if the products have been subjected to improper use, mishandling, alteration, improper maintenance or show signs of negligent use or being involved in an accident. These situations could include an incorrect power connection, impacts with other objects, removal or disarming of security fittings/measures, etc.

Please read these safety notes carefully and examine the equipment to become familiar with it before installing, commissioning or servicing.

The following symbols or messages may appear in this document or on the equipment. They warn of potential hazards or provide information that may help you clarify or simplify a procedure.

See instructions

This manual should be read before installation by properly qualified personnel. Incorrect installation can cause personal and equipment damage. You must consult the manual before maintenance or start-up.

Attention

This is a safety alert symbol. It warns of the potential of bodily injury.

Observe all safety information with this symbol to avoid any situation that could lead to injuries and/or damage to the unit.

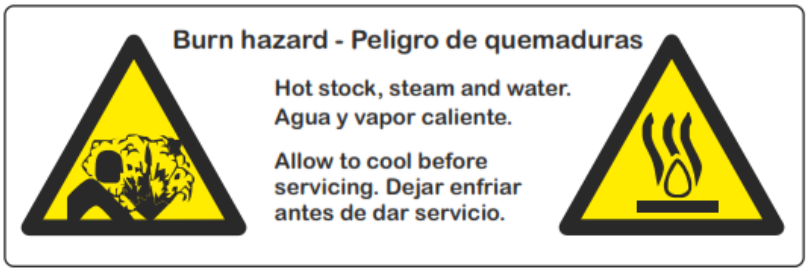
Attention, Live Current

The presence of this symbol on a hazard or warning label indicates that there is a risk of electrocution, which can lead to personal injury or life-threatening conditions if the instructions are not followed.

Turn off before opening

Turn off the power before opening the equipment to make new connections or perform maintenance in any part of it. Electric shock or fire may result if not turned off. Follow the equipment shutdown and control instructions to ensure the safety of the equipment and personnel.

Hot surface and danger of burns



This steam humidifier has extremely hot surfaces. Water in the tank, pipes and distribution assemblies can reach 100°C.

Contact with the equipment surfaces and boiler water inlets and outlets is very dangerous and can cause severe burns. Let the equipment cool down before maintenance or inspection of any part of the system. The steam injected/discharged may not be visible and is therefore dangerous.

Make sure that all threaded connections in the system are properly tightened so they cannot leak steam or condensed water. These can cause burns and/or serious injuries.

Contact with hot surfaces, with condensate water or air containing discharged steam can cause burns and/or serious injuries.

Insulation standards in equipment with hot surfaces:

According to the additional technical instructions standard, ITE 02.15.2 Hot Surfaces: *"Except for the surfaces of heat-emitting components, any equipment surface that can be touched accidentally must have a temperature lower than 60°C or be protected, where necessary ..."*

Appendix 03.1 of the same ITE, Minimum *thermal* insulation thickness: *"Equipment components (e.g. devices, appliances, pipes and accessories) must have a thermal insulation with the minimum thickness outlined below when they contain fluids at temperature: Lower than the environment, above 40°C and located in unheated rooms, including conduits, galleries, machine rooms and similar ..."* This type of equipment should be thermally insulated.

General points

- If you notice that something is not working properly, switch off the unit immediately and take steps to ensure that it does not switch on again. All faults must be corrected immediately.
- Use duly qualified personnel to carry out repair work. This will ensure that the unit operates safely.
- Use only original FISAIR replacement parts.
- Refer to local regulations that restrict or regulate the use of this humidifier.

How the unit works

- Do not jeopardise the safety of the unit.
- Periodically check the device's protection and alert devices.
- The unit's safety fittings must not be removed or disabled.

Installing, Disassembling, Maintaining and Repairing the unit

- Switch off the unit's power supply when conducting maintenance work or making repairs to the unit.
- Never add components to the unit without prior written approval from FISAIR.

About the electrical components

- Any work that affects the electrical components must be carried out by qualified electricians.
- Switch off the power supply and ensure that it does not re-connect while any electrical component is being handled.
- Switch off the unit immediately if any fault is detected in the electrical power supply.
- Use only original, correctly calibrated fuses.
- Carry out periodic checks of the electrical unit.
- All defects, such as loose connections or burnt cables, must be repaired immediately.

3 Transport and storage

When in transit, the unit must be protected from impacts of any kind, and all possible measures must be taken to prevent malfunctions due to improper loading or unloading of the unit.

When lifting the equipment, always use a pallet truck or forklift.

Upon receipt of the unit, make sure that the type and serial number of the plate correspond to the order and delivery information. Check that the unit is complete and in perfect conditions. If there are components missing or damaged during transport, immediately inform your supplier in writing.

Keep the unit dry and protected from the elements while in storage. If it has to be stored for a long period before installation, choose a place where the equipment will not be damaged mechanically or be contaminated by dust or construction materials. If stored outdoors, protect it against the weather and atmospheric elements.

Attention

Avoid direct exposure to the sun and places that can exceed 50°C.

Note: Storage area temperature and humidity conditions:

- Temperature: [-20…+50ºC]
- Relative humidity: [5…95% RH] no condensation.

Check the merchandise upon receipt. Check that the type and serial number of the label corresponds to the order and supply information, and that the equipment is complete and in good condition.

Note: Immediately inform your carrier in writing if there is any transportation damage or missing components.

4 Rating plate

The rating plate provide essential information about the technical features of the machine.

The EC Machinery Safety Regulation requires all machinery operated within the European Economic Community to have a rating plate indicating its main features, the machine serial number and the manufacturer's name inscribed in a durable manner.

According to article 2, section g of the Machinery Directive 2006/42/CE - RD 1644/2008, 'partly completed machinery' means:

"Partly completed machinery""an assembly which is almost machinery, but which cannot in itself perform a specific application. A drive system is partly completed machinery. Partly completed machinery is intended only to be incorporated into or assembled with other machinery or other partly completed machinery or equipment, thereby forming machinery to which this Directive applies"

According to article 2, section g of the Machinery Directive 2006/42/CE - RD 1644/2008, 'interchangeable equipment' means:

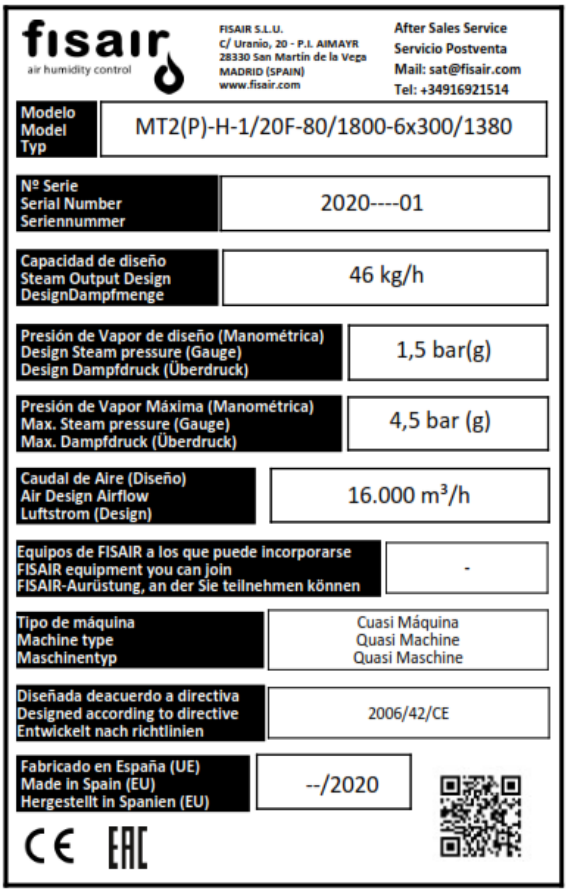
" Interchangeable equipment ": a device which, after the commissioning of a machine or a tractor, is coupled by the operator himself to said machine or tractor to modify its function or provide a new function, provided that this equipment is not a tool"

Therefore, the classification of the MT2 equipment varies depending on whether it is pressurized MT2 (P) or non-pressurized MT2 (NP) (and therefore depending on whether it has a control valve or not):

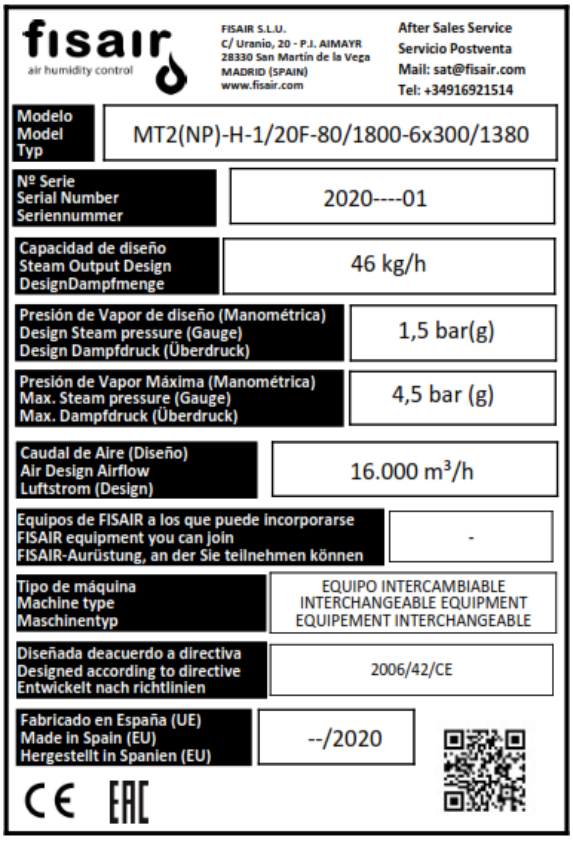
- MT2 (P) Pressurized steam → **partly completed machinery (quasi machine)**
- MT2 (NP) Non-pressurized steam → **interchangeable equipment**

The DIPHUSAIR-MT2 series incorporates the following information on its plate:

- Equipment model
- Equipment serial number
- Design capacity
- Design steam pressure (gauge)
- Maximum steam pressure (gauge)
- Design air flow
- FISAIR devices it can be joined with
- Machine type: Partly completed machinery or interchangeable equipment
- Designed in accordance with directive
- Place and date of manufacture
- QR code for technical assistance service and warranty activation



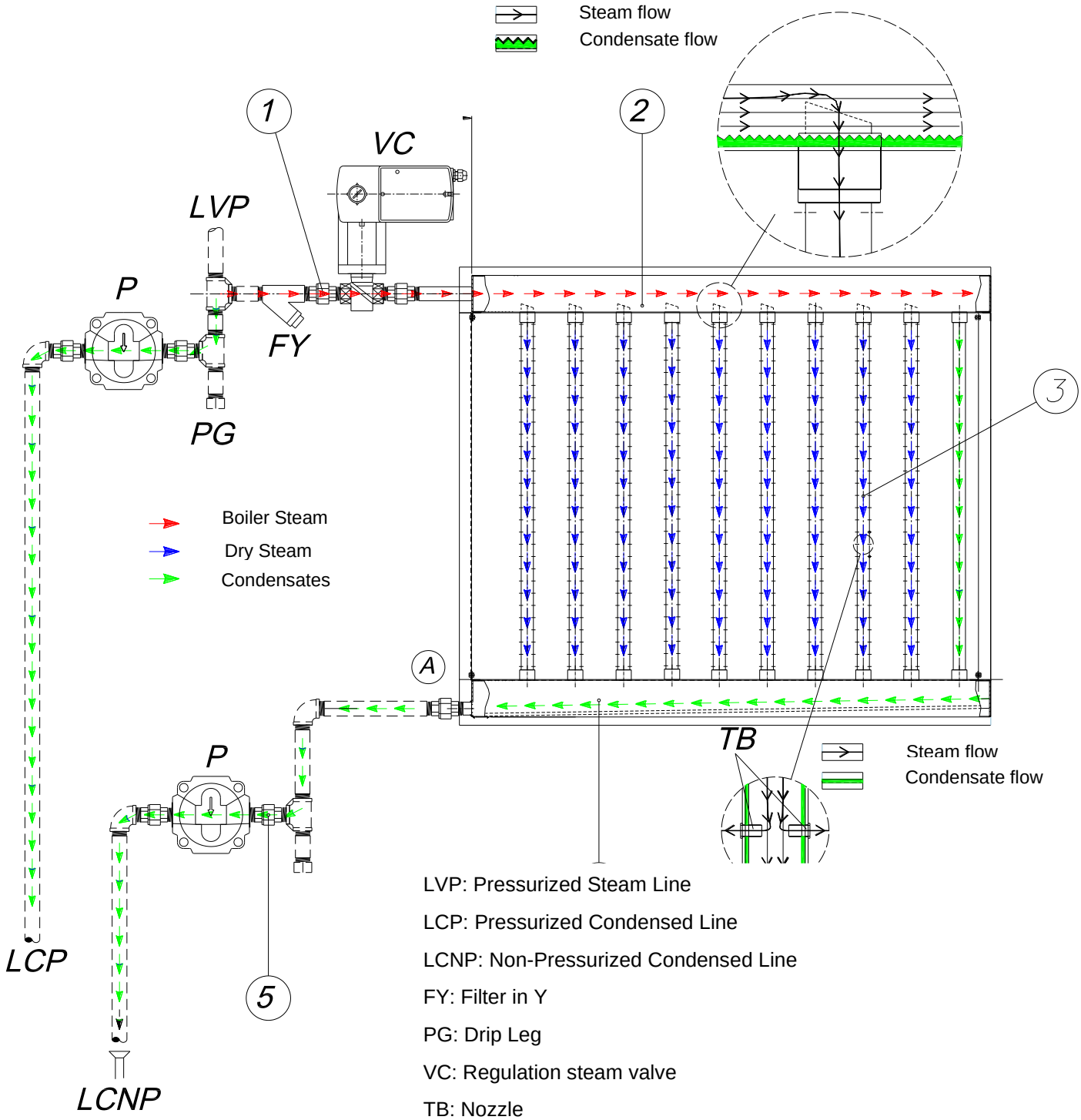
Example of a DIPHUSAIR-MT2(P) device specification plate



Example of a DIPHUSAIR-MT2(NP) device specification plate

5 Operating principle and components

5.1 Pressurized Steam MT2



LVP: Pressurized Steam Line

LCP: Pressurized Condensed Line

LCNP: Non-Pressurized Condensed Line

FY: Filter in Y

PG: Drip Leg

VC: Regulation steam valve

TB: Nozzle

P: Steam Trap

EXTERNALLY SUPPLIED COMPONENTS - - - - - -

The FISAIR DIPHUSAIR MT2 (P) air humidifier series work by steam injection to isothermally increase the absolute air humidity in a controlled manner, such as in an AHU or duct:

1. The supply steam is filtered before reaching the valve (proportional actuator) controlling the steam flow to the MT2 steam dispersion system. The drip leg/pressurised condensate line located before the filter collects all the condensate and drains it to the pressurised condensate line.

2. The steam enters the collector located in the upper header and then into the dispersion tubes as it moves through the tube (see close-up). The condensate formed in the upper collector is removed by the blind tube installed for this purpose.

3. The steam is discharged uniformly throughout the length of the dispersion tubes through the nozzles. The condensate produced in the dispersion tubes descends down the tube walls without being able to reach the nozzles and settles in the collector located in the lower header. (See close-up)

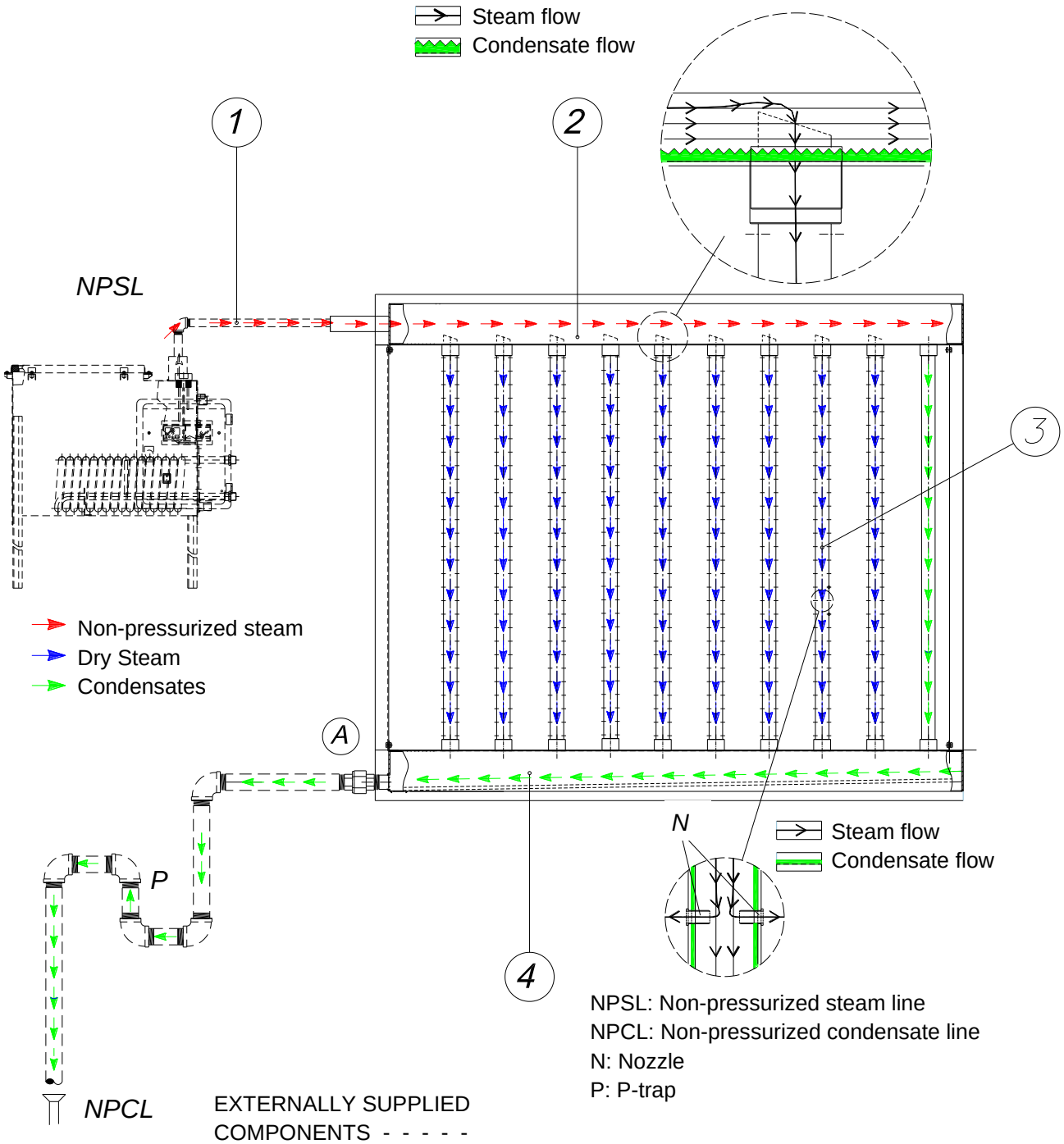
4. This lower collector contains all the condensate from the upper collector through the condensate pipe as well as all the condensate produced in each dispersion tube.

5. Another line with a drip leg and steam trap moves the condensate towards the non-pressurised condensate line.

MT2 (P) REFERENCES:

MODEL RANGE MT2 (Pressurized)					(S) STANDARD (H) HYGIENIC		INLETS QTY.		INLET DIAMETER VALVE (DN)	INLET TYPE: THREADED(T) / FLANGED(F)		SQUARE COLLECTOR SIZE (S)		AHU/ DUCT AVAILABLE WIDTH (mm)		TUBES QTY.(NT)		TUBE PITCH		AHU/ DUCT AVAILABLE HEIGHT (mm)
MT2(P)	-	S	-	1	/	15	T	-	80	/	XXXX	-	FROM 2 TO 36	x	75	/	YYYY			
		H				20	F		100						150					
						25			120						225					
						32			150						300					
						40														
						50														

5.2 MT2 Non-pressurized steam



The FISAIR DIPHUSAIR MT2 (NP) air humidifier series work by steam injection to isothermally increase the absolute air humidity in a controlled manner, such as in an AHU or duct:

1. The non-pressurized steam supply comes directly from a steam generator at atmospheric pressure. Such as our clean atmospheric pressure steam generator units, DIPHUSAIR VxV, DIPHUSAIR ASC, DIPHUSAIR RESISTANCE and DIPHUSAIR ELECTRODES.

2. The steam enters the collector located in the upper header and then into the dispersion tubes as it moves through the tube (see close-up). The condensate formed in the upper collector is discharged by the blind tube installed for this purpose.

3. The steam is discharged uniformly throughout the length of the dispersion tubes through the nozzles. The condensate produced in the dispersion tubes descends down the tube walls without being able to reach the nozzles and settles in the collector located in the lower header. (See close-up)

4. This lower collector contains all the condensate from the upper collector through the condensate pipe as well as all the condensate produced in each of the dispersion tubes.

5. The condensate is discharged through the line with a P-trap to the sump or non-pressurized condensate line.

MT2 (NP) REFERENCES:

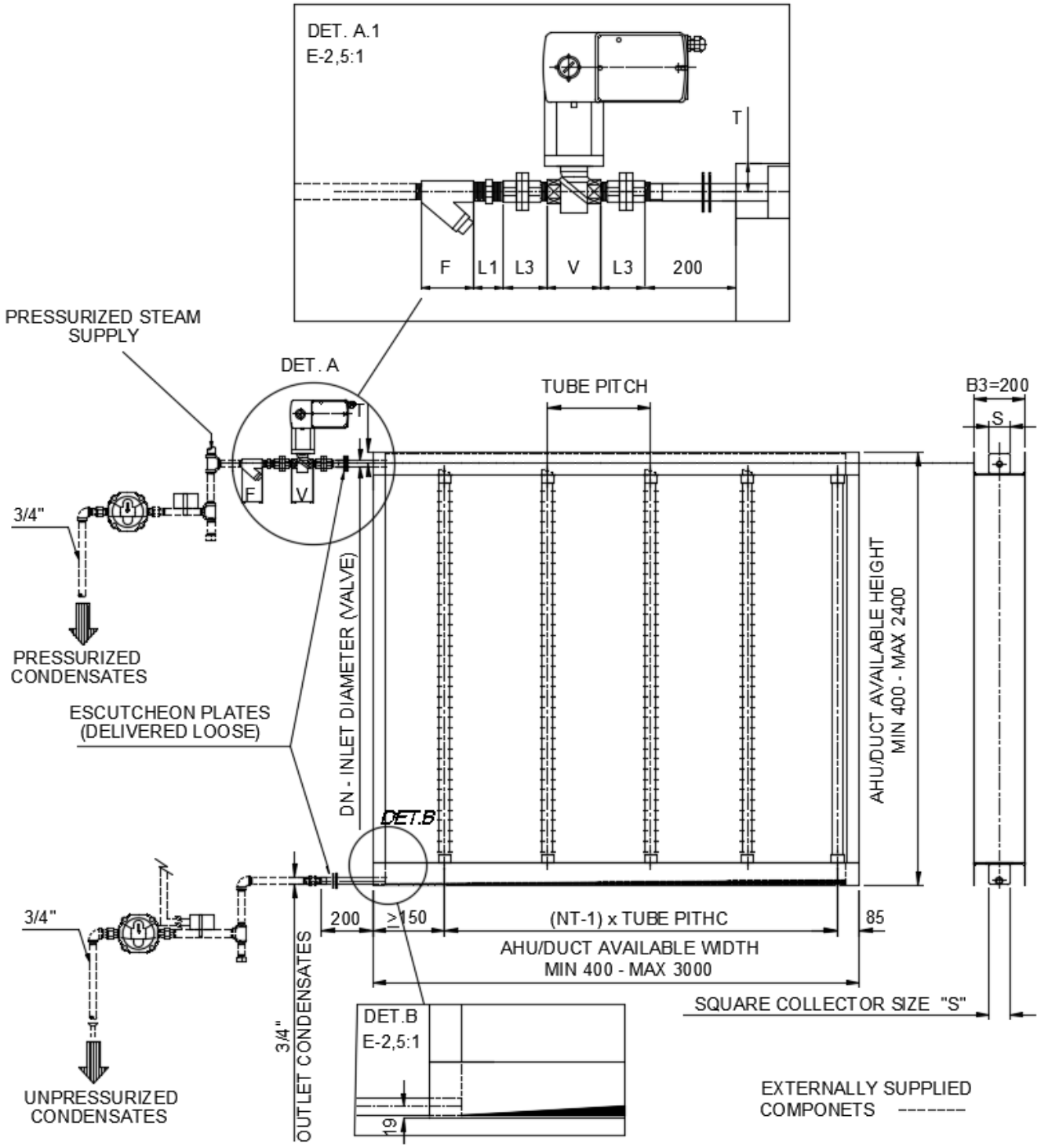
MODEL RANGE MT2 (Unpressurized)	HYGIENIC	INLETS QTY.	MULTIPLE ENTRY	INLETS DIAMETER (Di)	SCUARE COLLECTOR SIZE (S)	AHU/ DUCT AVAILABLE WIDTH (mm)	TUBES QTY.(NT)	TUBE PITCH	AHU/ DUCT AVAILABLE HEIGHT (mm)
MT2(NP)	H	1	0	25	80	XXXX	FROM 2 TO 36	75	YYYY
		2	TYPE L	40	100			150	
		3	TYPE T	50	120			225	
		4		76	150			300	
		5		104					
		6		129					
		8							
		10							
		12							

MT2 (NP SPECIAL) REFERENCES:

MODEL RANGE MT2 (Unpressurized)	HYGIENIC	INLETS DIAMETER (Di)	INLET TYPE: THREADED(T)/FLANGED(F)	SCUARE COLLECTOR SIZE (S)	AHU/ DUCT AVAILABLE WIDTH (mm)	TUBES QTY.(NT)	TUBE PITCH	AHU/ DUCT AVAILABLE HEIGHT (mm)
MT2(NP)	H	25	T	80	XXXX	FROM 2 TO 36	75	YYYY
		40	F	100			150	
		50		120			225	
		76		150			300	
		104						
		129						

6 General dimensions

6.1 Unión threaded valve (MT2 pressurized steam)



		VALVES: MEASUREMENT “V” (mm)		FILTER: MEASURMENT “F” (mm)
		Threaded		Threaded
DN (mm)	DN (")	Bronze	Stainless steel	Stainless steel
15	1/2"	78	76	64
20	3/4"	92	91	80
25	1"	118	/	90
32	1-1/4"	118	/	106
40	1-1/2"	137	/	119
50	2"	156	/	140

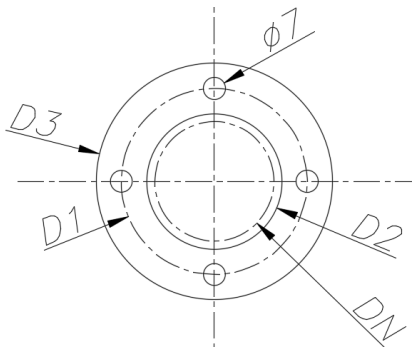
FIG 331 H-M AISI A316 Flat Gasket PTFE (Teflon)	
DN (“)	L3 (mm)
1/2"	58
3/4"	67
1"	68.3
1-1/4"	83
1-1/2"	86.3
2"	94

FIG.280 AISI A316	
DN (")	L1(mm)
1/2"	34
3/4"	40
1"	46
1-1/4"	52.5
1-1/2"	54
2"	62

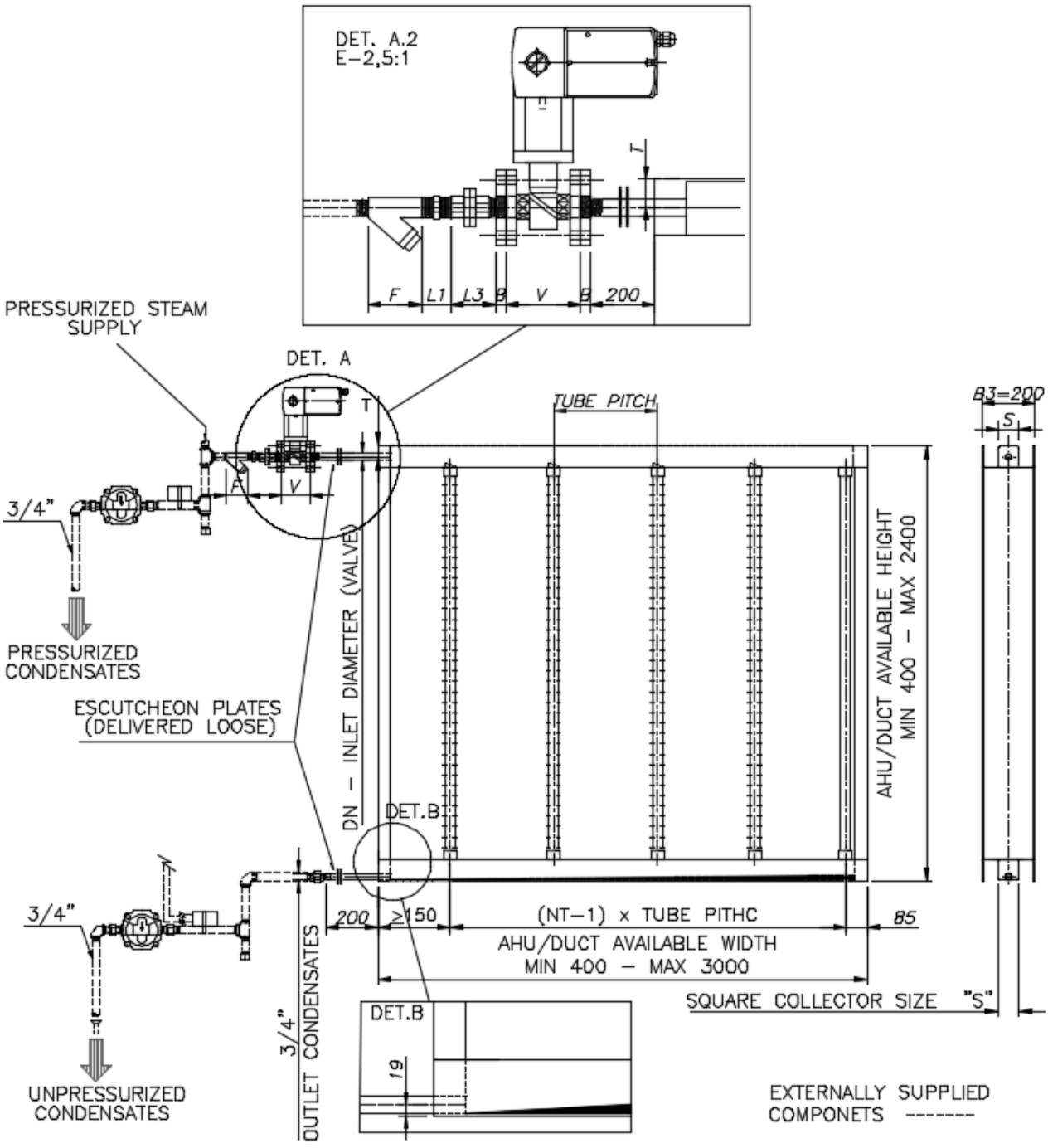
MEASUREMENTS “T” and “S”	
Square collector size (mm) “S”	T (mm)
80	45
100	55
120	65
150	80

ESCUTCHEON PLATES PRESSURIZED MT2				
DN(mm)	DN(")	D2(mm)	D1(mm)	D3(mm)
15	1/2"	24	44	60
20(*)	3/4"	29	44	60
25	1"	36	64	80
32	1-1/4"	44	70	90
40	1-1/2"	51	90	112
50	2"	62	110	132

(*) These dimensions are also used on the escutcheon plates of the condensate drain



6.2 Flanged valve union (MT2 pressurized steam)



		VALVES: MEASUREMENT “V” (mm)		FILTER: MEASUREMENT “F” (mm)
		Flanged		Threaded
DN (mm)	DN (")	Cast steel	Stainless steel	Stainless steel
15	1/2"	130	184	64
20	3/4"	150	184	80
25	1"	160	184	90
32	1-1/4"	180	/	106
40	1-1/2"	200	222	119
50	2"	230	254	140

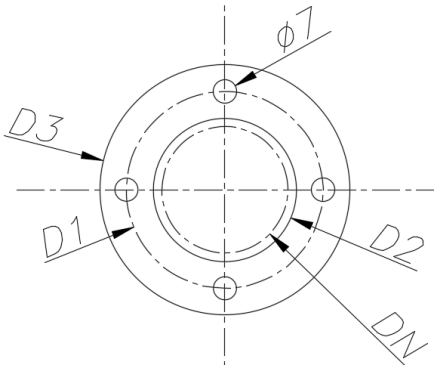
FIG.280 AISI A316	
DN (")	L1 (mm)
1/2"	34
3/4"	40
1"	46
1-1/4"	52.5
1-1/2"	54
2"	62

LOOSE FLANGE DIN 2576	
DN (")	B (mm)
1/2"	14
3/4"	16
1"	16
1-1/4"	18
1-1/2"	18
2"	20

THREADED FLANGE DIN 2576	
DN (")	B (mm)
1/2"	14
3/4"	16
1"	16
1-1/4"	18
1-1/2"	18
2"	20

MEASUREMENTS “T” and “S”	
Square collector size (mm) “S”	T (mm)
80	45
100	55
120	65
150	80

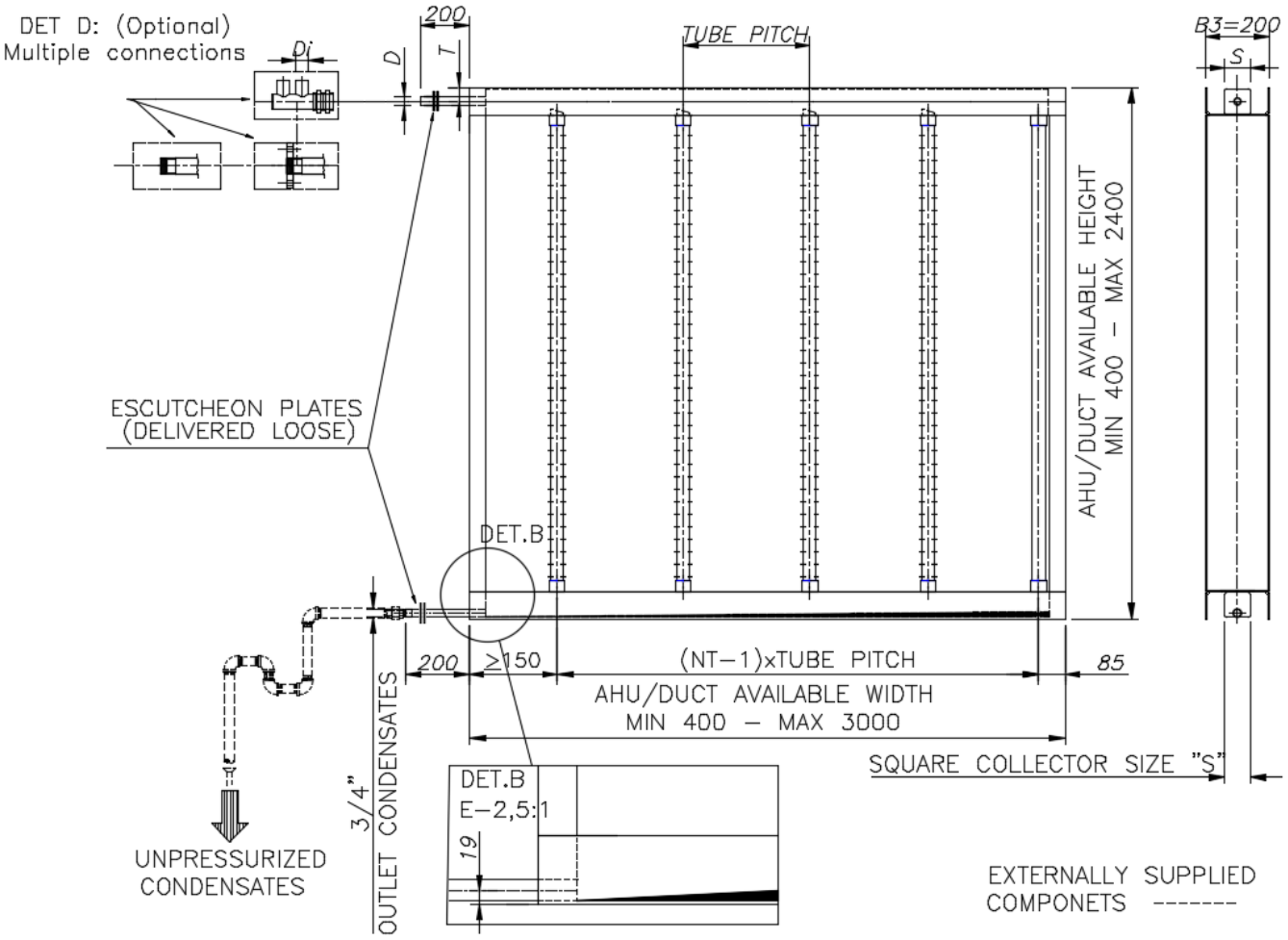
FIG 331 H-M AISI A316 Flat Gasket PTFE (Teflon)	
DN (“)	L3 (mm)
1/2"	58
3/4"	67
1"	68.3
1-1/4"	83
1-1/2"	86.3
2"	94



ESCUTCHEON PLATES PRESSURIZED MT2				
DN(mm)	DN(")	D2(mm)	D1(mm)	D3(mm)
15	1/2"	24	44	60
20(*)	3/4"	29	44	60
25	1"	36	64	80
32	1-1/4"	44	70	90
40	1-1/2"	51	90	112
50	2"	62	110	132

(*) These dimensions are also used on the escutcheon plates of the condensate drain

6.3 General dimensions MT2 non-pressurized steam



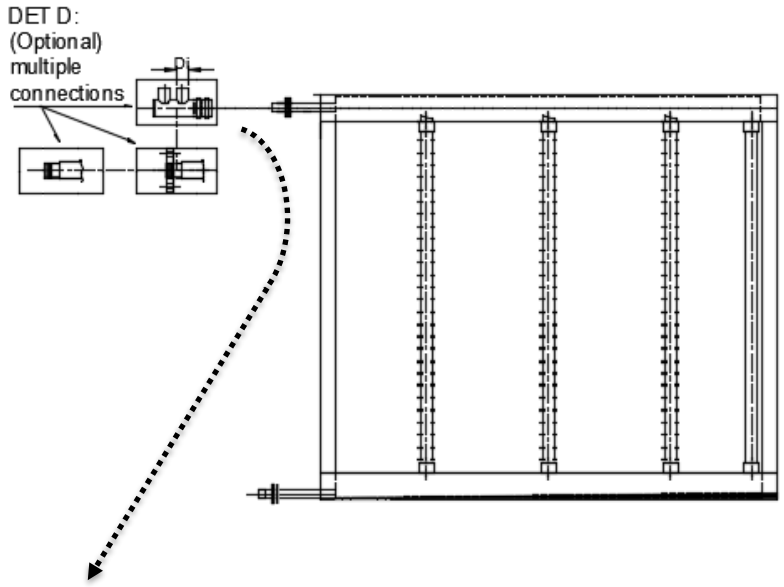
MEASUREMENTS “T” and “S”	
Square collector size “S” (mm)	T (mm)
80	45
100	55
120	65
150	80

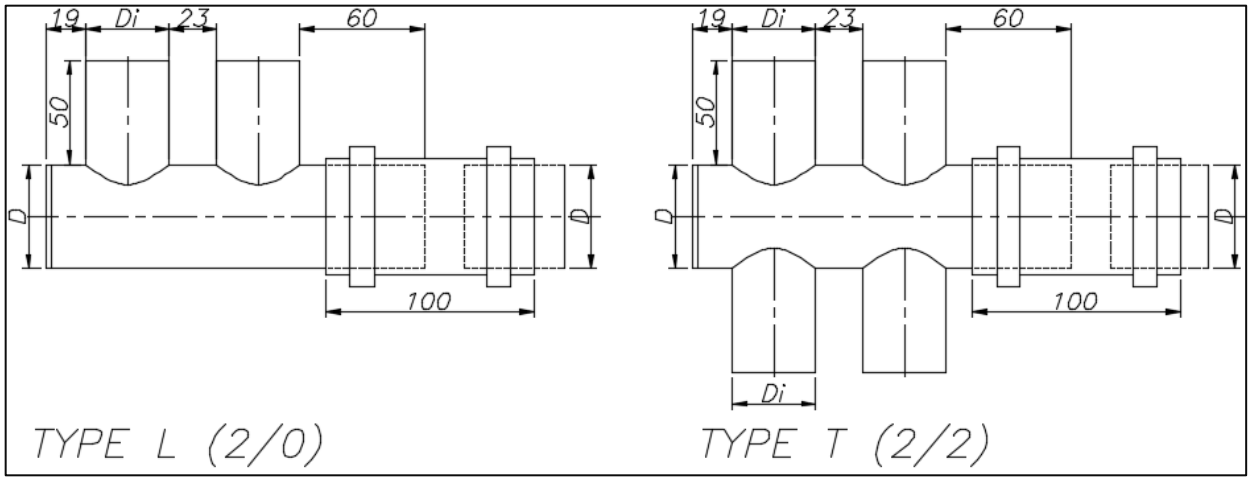
DET D: Input connection options (NP Standard):

To obtain the “D” dimension you have the following options:

- Standard: “Inlets QTY” =1 → D= “Inlet Diameter (Di)”
- Optional Type L or Type T: “Inlets QTY”>1 and “Humidification capacity” ≤ 116 kg/h(see Rating Plate) → D=Next diameter size at the references standardized diameters "Inlets Diameter (Di)"
- Optional Type L or Type T: “Inlets QTY”>1 and “Humidification capacity” > 116 kg/h(see Rating Plate) → Ask Fisair for the “D” size

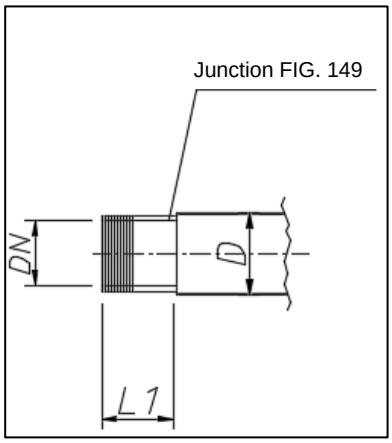
DET D: optional, multiple inputs:

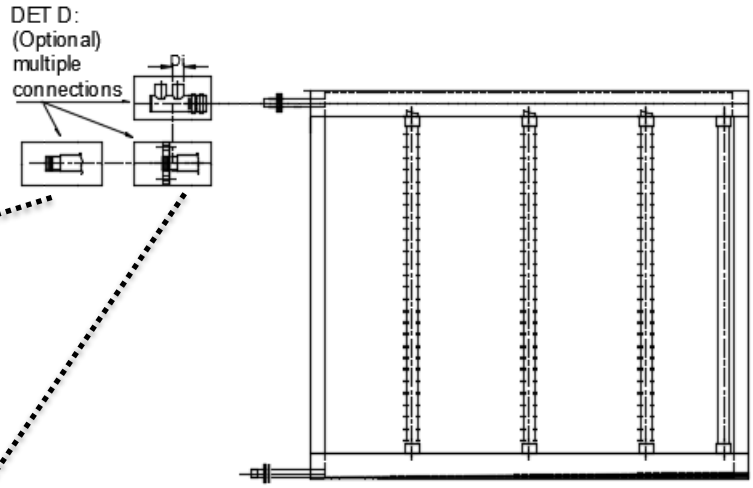




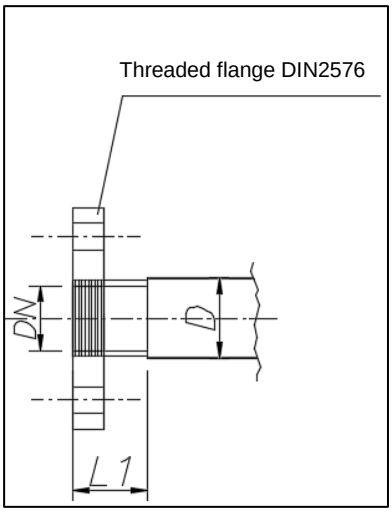
DET D: Optional, threaded or flanged connection (NP Special):

THREADED INPUT





FLANGED INPUT



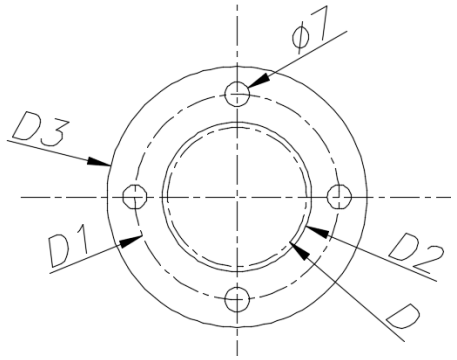
TRANSFORMATION SMOOTH → THREADED/FLANGED		
D(mm)	DN (mm)	L1(mm)
40	32	50
50	40	50
76	60	60
104	100	80

ESCUTCHEON PLATES:

ESCUTCHEON PLATES NON PRESSURIZED MT2 (threaded/flanged)				
Threaded BSPT DN = D[“]	Flanged DIN2576 DN = D[“]	D2(mm)	D1(mm)	D3(mm)
1/2"	1/2"	24	44	60
¾”(*)	¾”	29	44	60
1 “	1 “	36	64	80
1 ¼”	1 ¼”	44	70	90
1 ½”	1 ½”	51	90	112
2“	2“	62	110	132

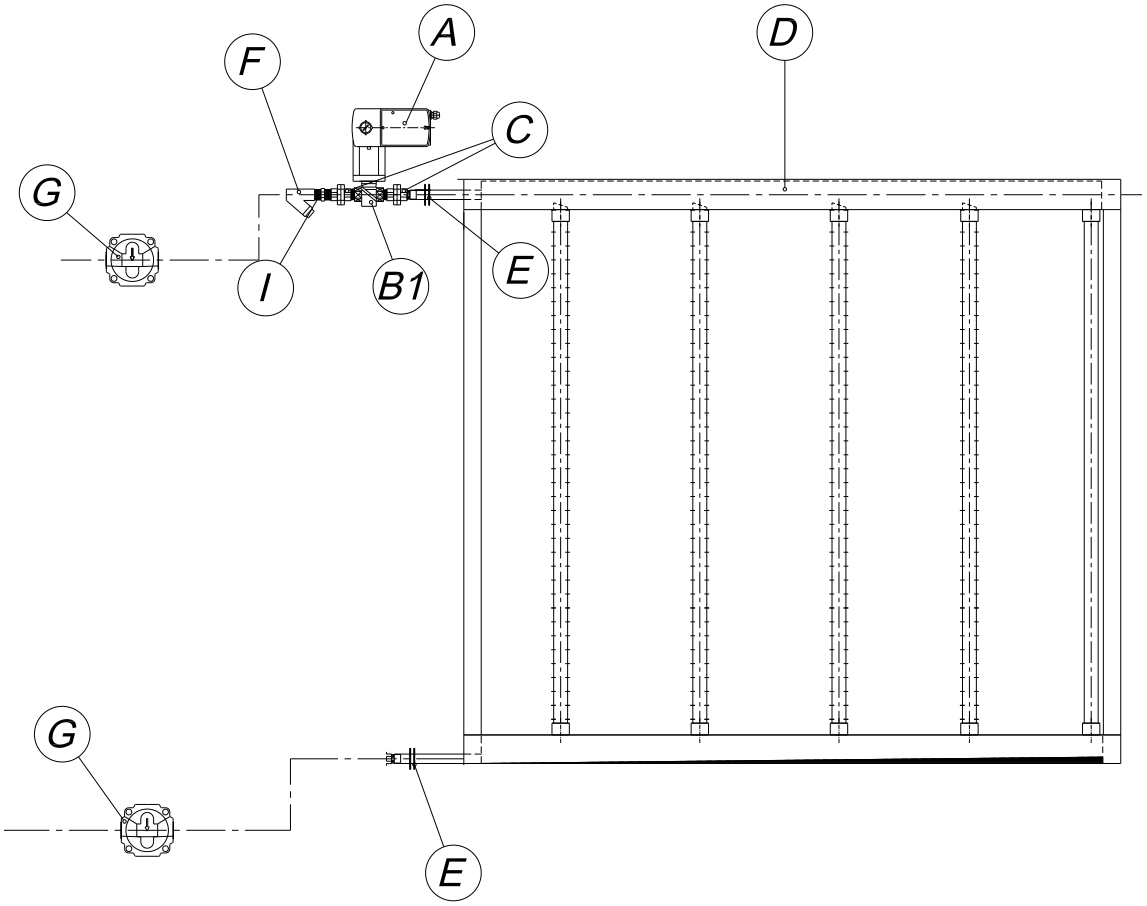
(*) These dimensions are also used on the escutcheon plates of the condensate drain

ESCUTCHEON PLATES NON PRESSURIZED MT2 (Smooth)			
D(mm)	D2(mm)	D1(mm)	D3(mm)
40	43	59	75
50	53	69	85
76	79	95	111
104	107	123	139
129	132	148	164



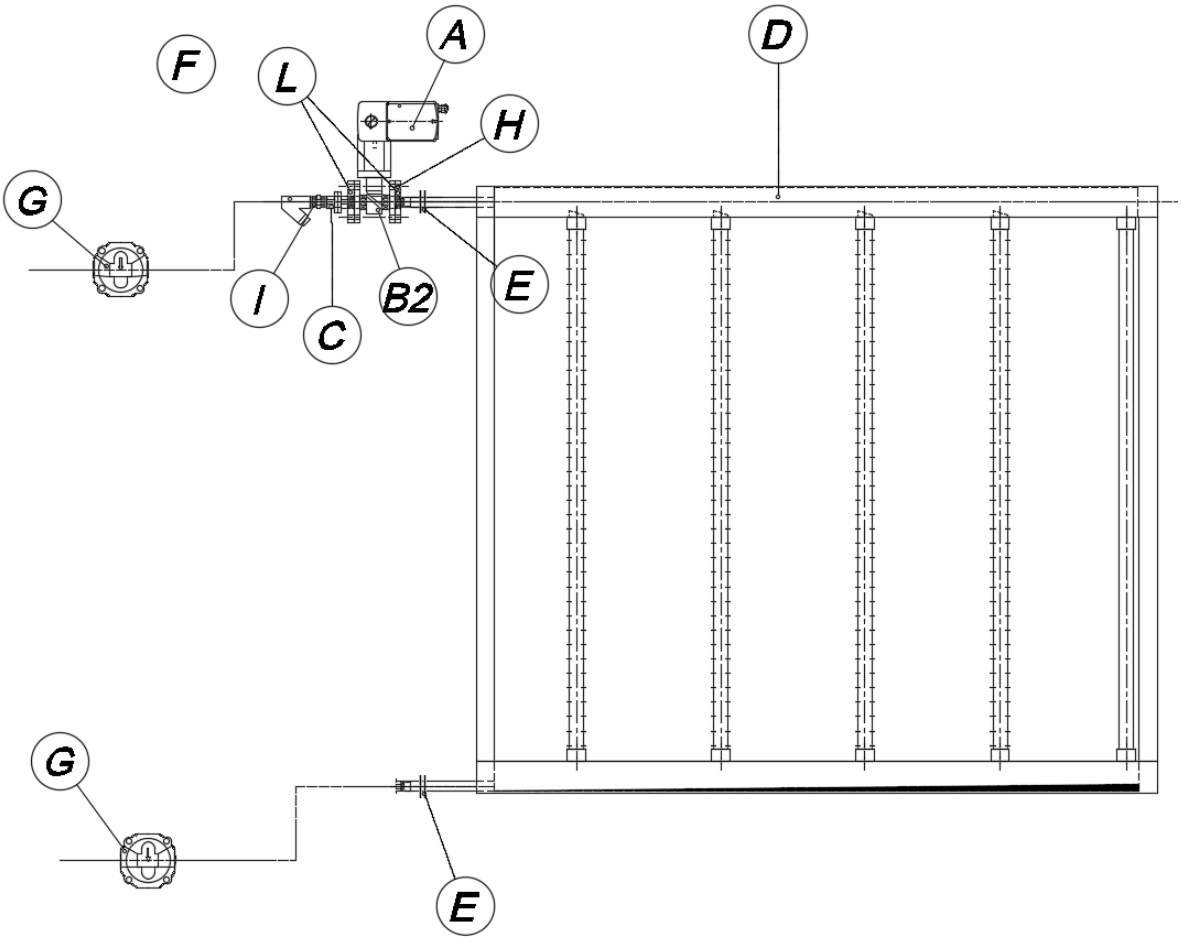
7 MT2 Standard Components

7.1 Threaded valve (MT2 pressurized steam)



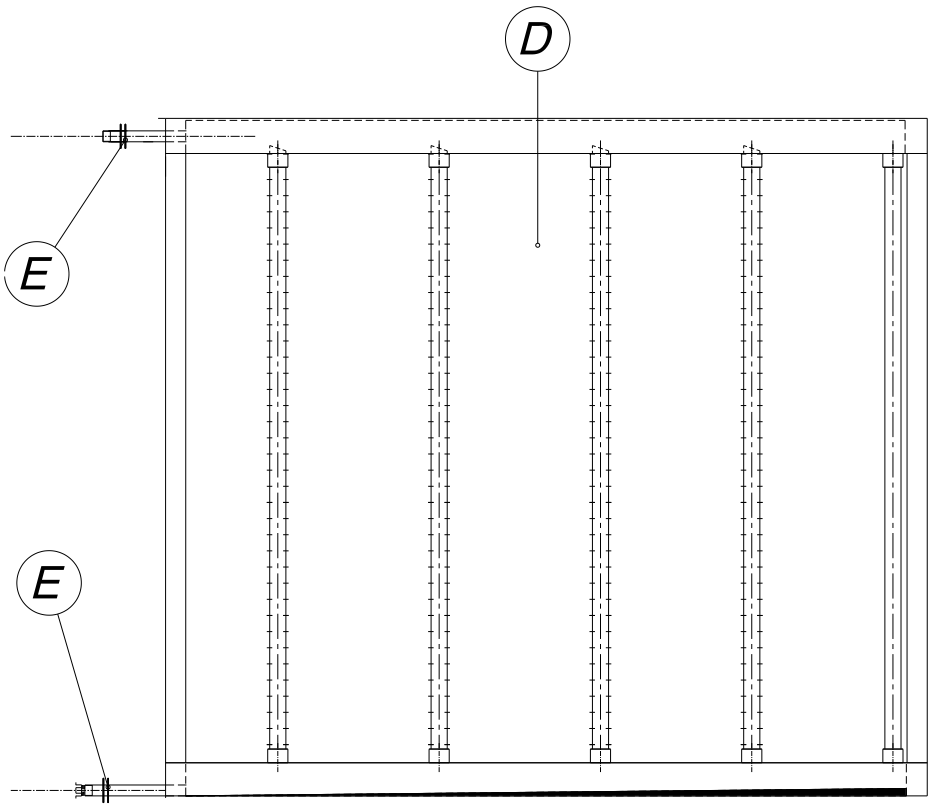
A - ACTUATOR
B1 - THREADED VALVE
C - LINKS
D - MT2
E –ESCUTCHEON PLATES (2 per line)
F - FILTER “Y”
G – STEAM TRAP
I – MALE LINK

7.2 Flanged valve connection (MT2 pressurized steam)



A - ACTUATOR
B2 - FLANGED VALVE
C - LINK
D - MT2
E – ESCUTCHEON PLATES (2 per line)
F - FILTER “Y”
G – STEAM TRAP
H - FLANGE FITTINGS
I – MALE LINK
L - THREADED FLANGES

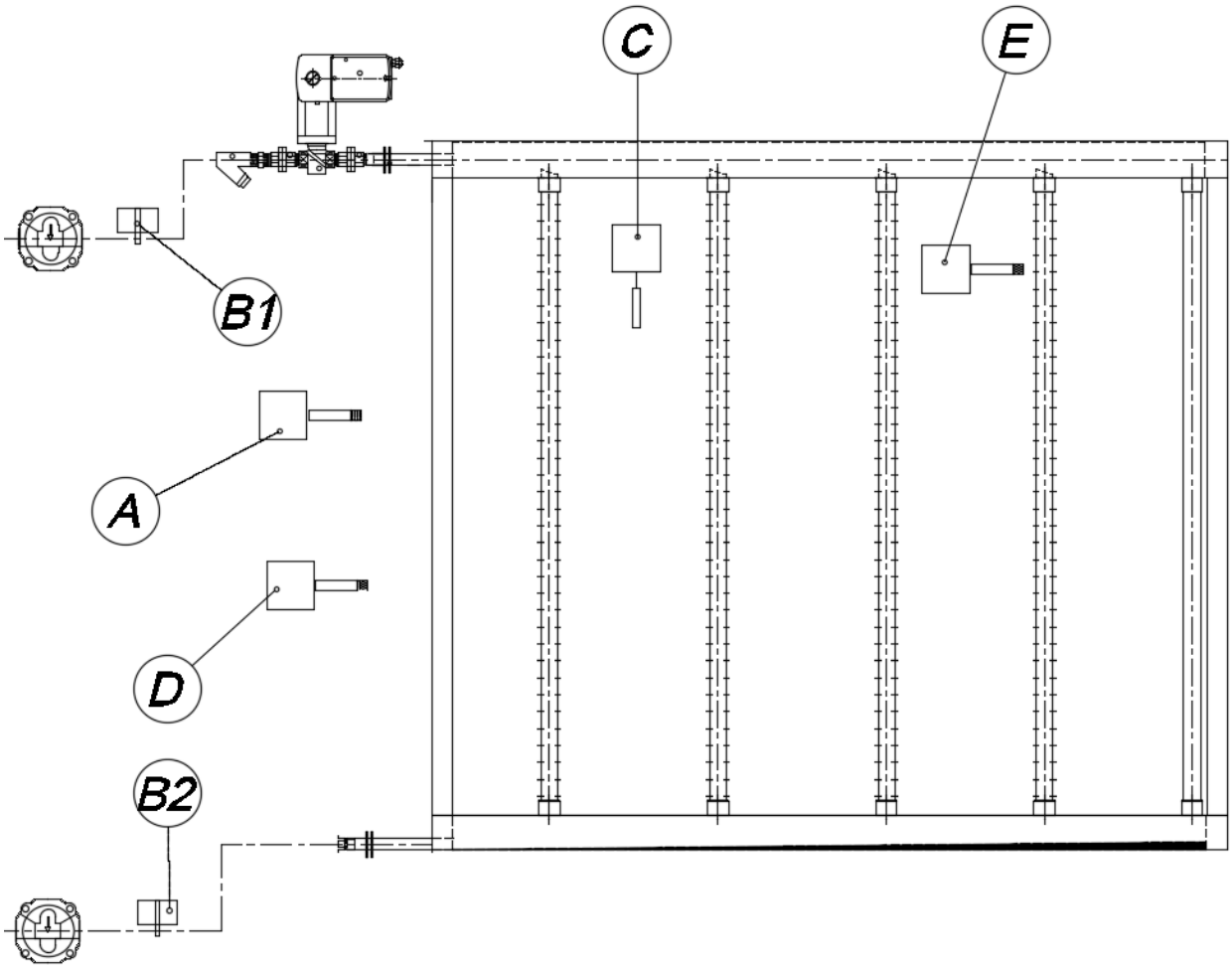
7.3 Standard Components (MT2 non-pressurized steam)



D - MT2
E – ESCUTCHEON PLATES (2 per line)

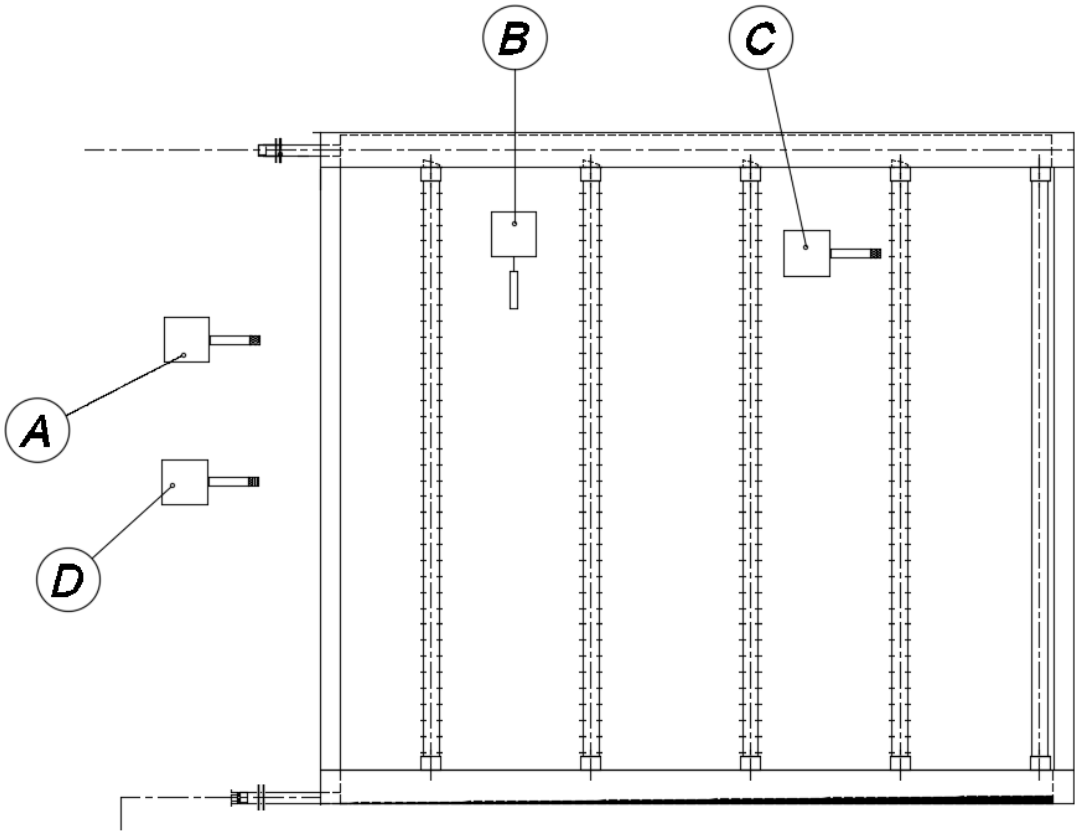
8 Optional MT2 Humidifier Components

8.1 MT2 Pressurized steam



A – HUMIDISTAT (R.H.) WITH ENVIRONMENTAL/ROOM OR DUCT/AHU ACTIVE PROBE
B1 - NON-DRIP SAFETY THERMOSTAT (PREFERENTIAL POSITION)
B2 - NON-DRIP SAFETY THERMOSTAT (SECONDARY POSITION)
C- FLOW SWITCH
D - DOUBLE ACTIVE PROBE (TEMPERATURE AND HUMIDITY H.R.), FOR DUCT/ AHU OR ROOM
E - MAXIMUM HUMIDITY CUT-OFF HYGROSTAT

8.2 MT2 Non-pressurized steam



A – HUMIDISTAT (RH) WITH ENVIRONMENTAL/ROOM OR DUCT/ATU ACTIVE PROBE
B - NON-DRIP SAFETY THERMOSTAT
D – DOUBLE ACTIVE PROBE (TEMPERATURE AND HUMIDITY R.H.), FOR DUCT/ ATU OR ENVIRONMENTAL/ROOM
E - MAXIMUM HUMIDITY CUT-OFF HYGROSTAT

9 Assembly and installation

9.1 Installation and assembly in AHU or duct.

If you are in any doubt about positioning the equipment in the AHU or duct, see section "Installation inside duct or AHU".

1) Unpack the equipment and check the parts list. If a component is missing, please contact us.

2) After making the holes (steam inlet/condensate outlet) in one of the panels/walls of the air conditioner/duct, insert the MT2 (in its entirety) within the air conditioner and position it crosswise to the duct. The upper and lower headers must be aligned with the upper and lower holes of the air conditioner duct wall.

3) Once the MT2 is inserted into the duct, remember to add one of the escutcheon plates before drilling the panel so that this is the internal escutcheon plate; place the other escutcheon plate on the end of the headers that projects outside the duct.

4) Connect the valve to the header via the established joints (threaded or flanged). Then add the Y-filter to the valve and this unit to the pipe. The steam traps should be placed, if necessary, in the pipe which is not supplied in both the upper and lower parts.

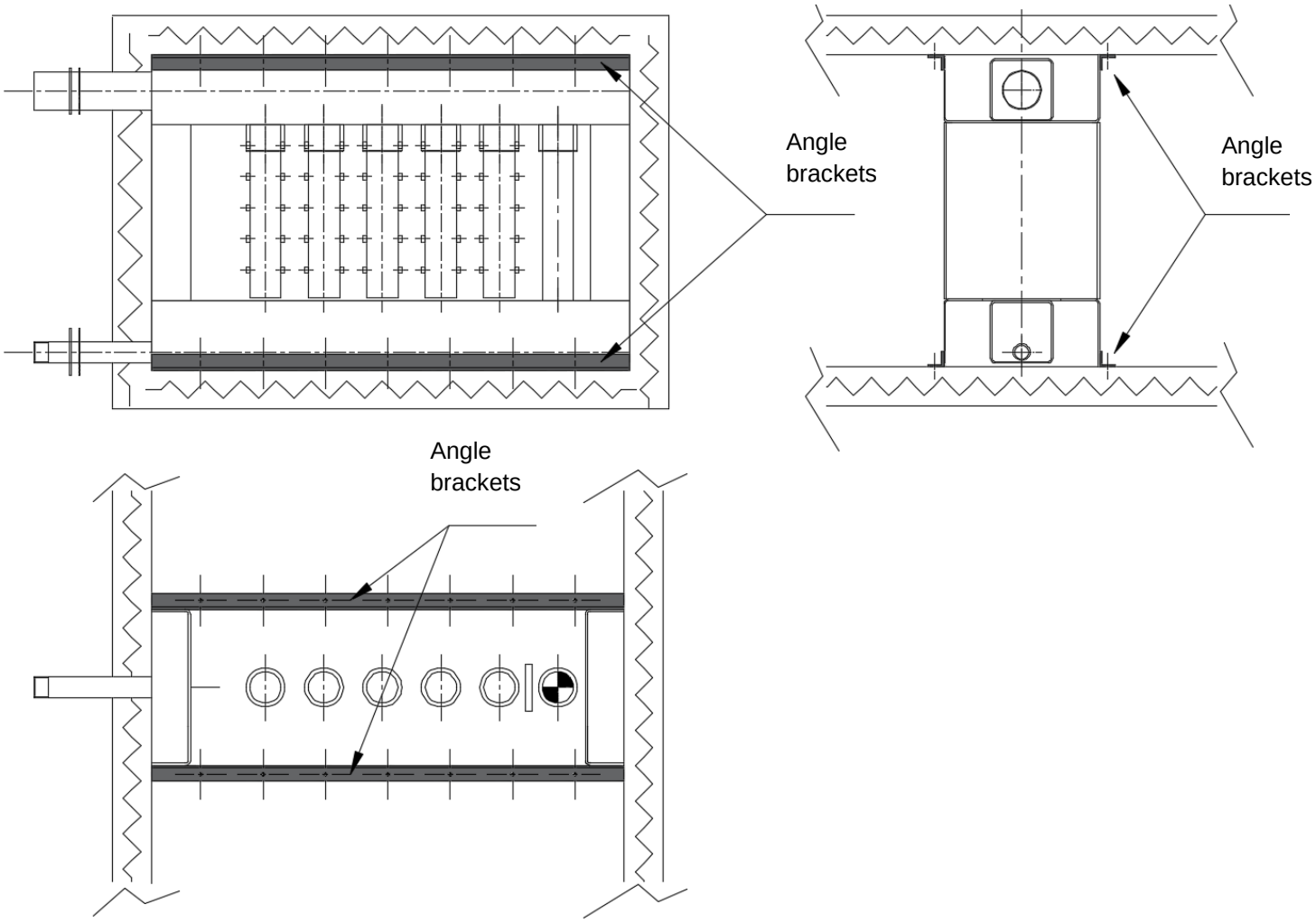
5) Make the electrical connections for the valve actuator.

Installation inside a duct or AHU.

1) Place the MT2 inside the duct/AHU so that it is crosswise to it. The manifold and condensate outlet pipes must go through the insulation holes made previously.

2) Once the equipment is placed inside, four angle brackets are placed on the ends of the MT2. Two plates are placed on the front face: one on the top and one on the bottom. These plates are attached to the wall/duct panel/air conditioner.

3) The same process is carried out on the back face.

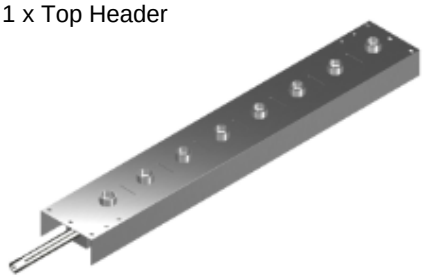


9.2 Assembly on site

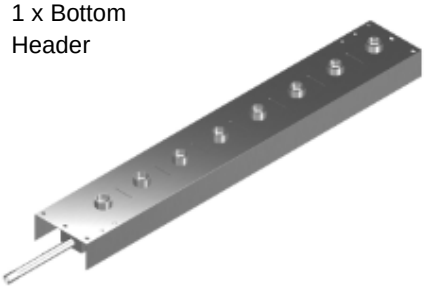
Sometimes, large units are delivered without assembling to reduce transportation costs.

The following components are available:

1 x Top Header



1 x Bottom Header

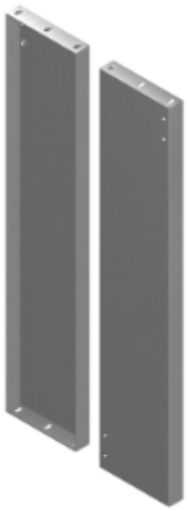


n x dispersion tubes with nozzles

12 x M8 Screws + nuts and 4 x M8 Screws/Brackets

Depending on size of MT2:

0, 2, 4 or 8 brackets



2 x Side supports

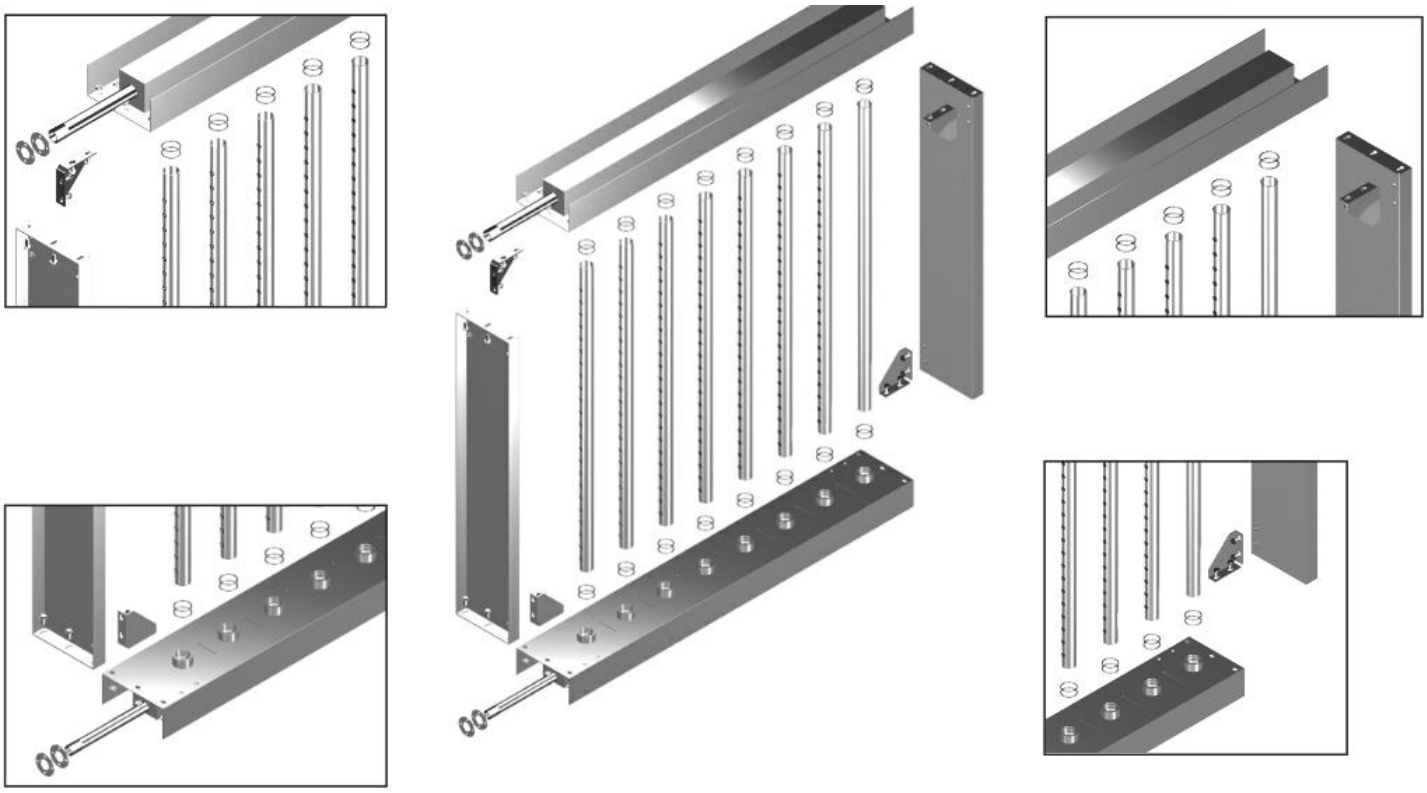
(1 x right and 1 x left)

1 x Condensate blind drain tube

4 x Covers (2 x drain tube outlet + 2 x steam inlet pipe)

4 x o-rings x n tubes

Assembly exploded diagram:

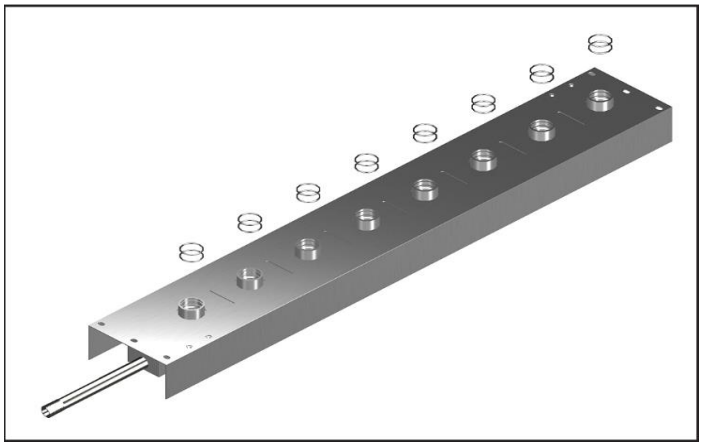


Note: 2 x 13 mm assembly keys are required.

Note: You should use gloves while assembling the equipment to prevent irritating your hands.

Follow these assembly steps:

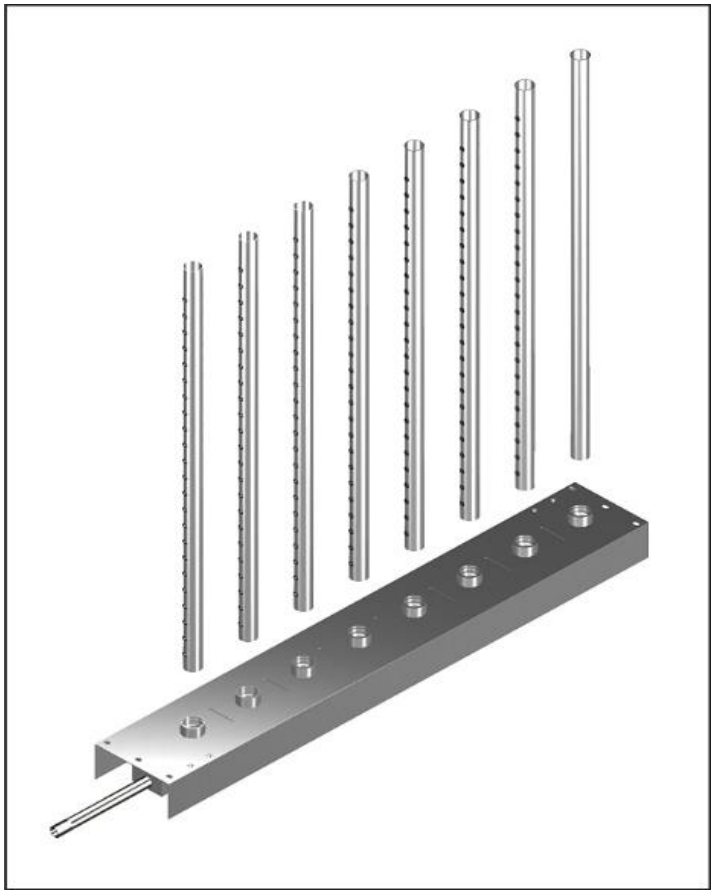
1. Place the washers in their positions on the two headers (top and bottom).



2. Insert the dispersion tubes with their nozzles and the condensate blind drainage pipes in the lower header.

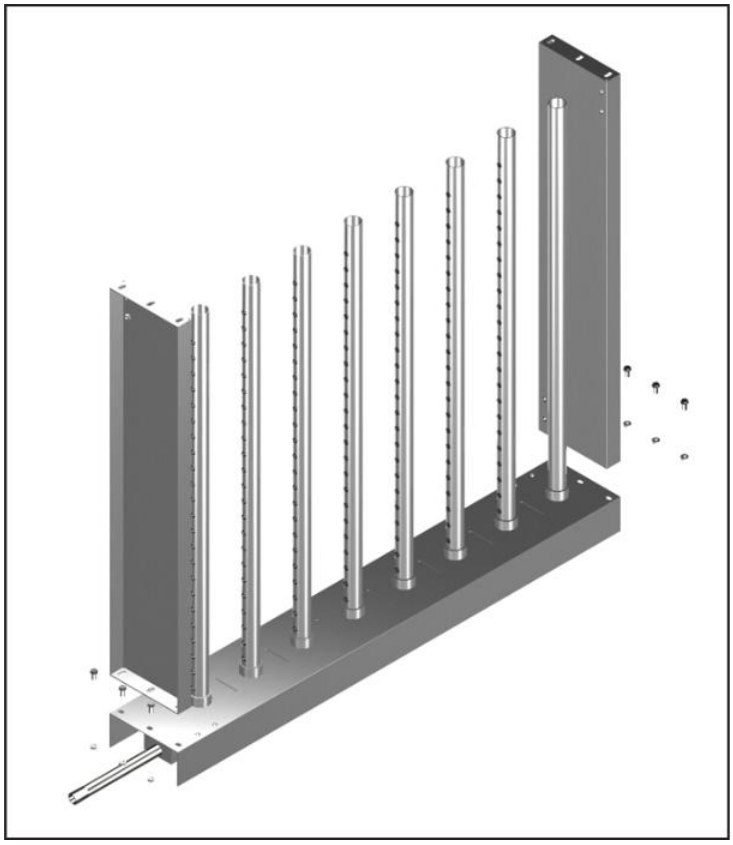
   Be careful when inserting the tubes so as not to damage the washers (we recommend applying an appropriate lubricant through the bottom of all dispersion tubes).

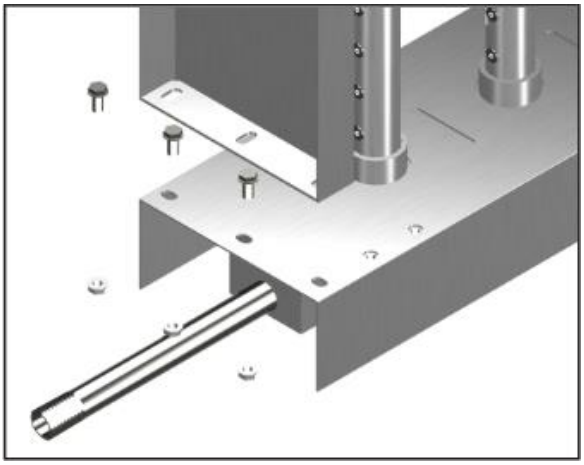
   The dispersion tubes have a specific position: The upper position corresponds to the largest tube distance without nozzles.
   The last tube is the blind condensate tube (without drill holes).

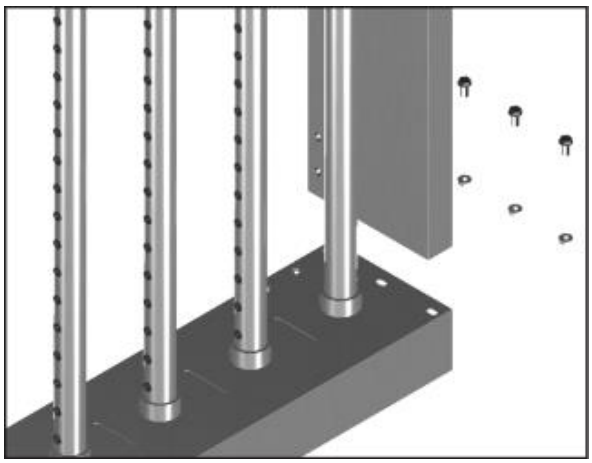


3. Place the side support plates on the lower header.

   Secure them loosely using the M8 bolts and nuts. Do not apply the final tightening yet.

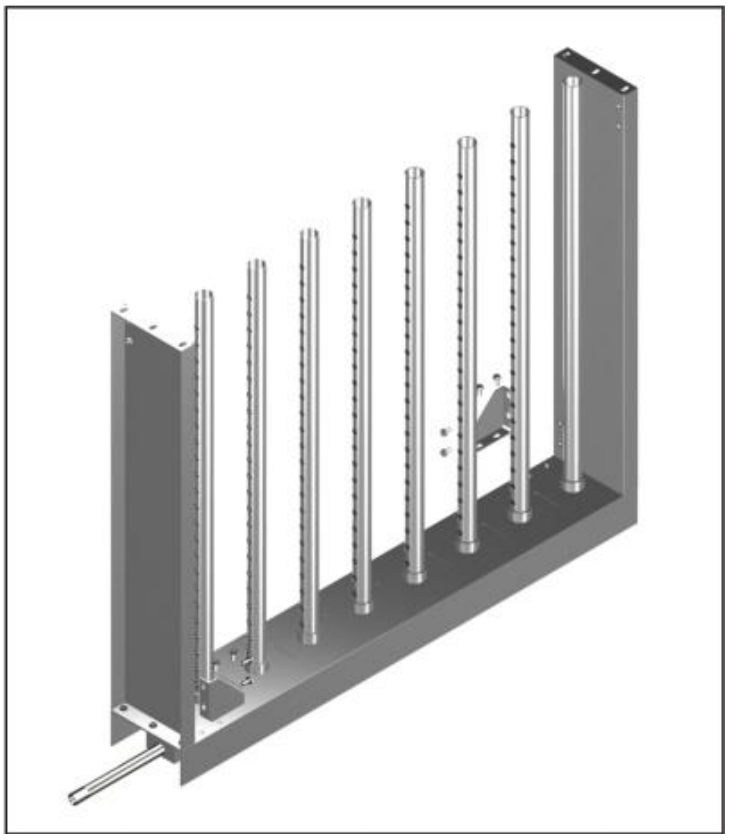


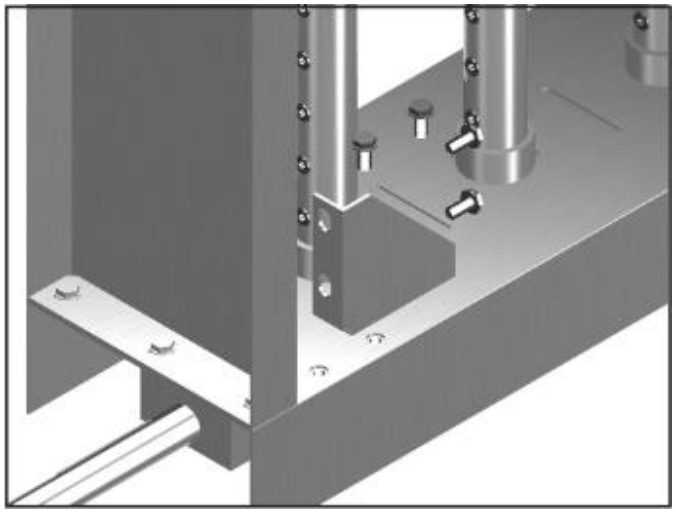


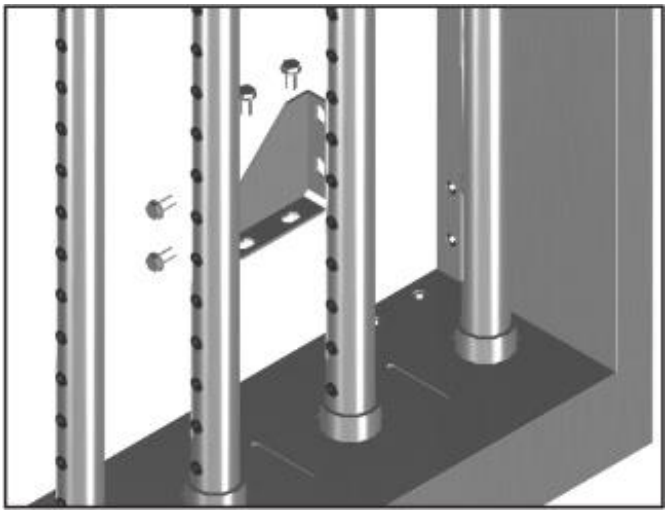


4. Place the brackets on the lower header against the side support plates.

   Secure them loosely using the M8 bolts and nuts. Do not apply the final tightening yet.



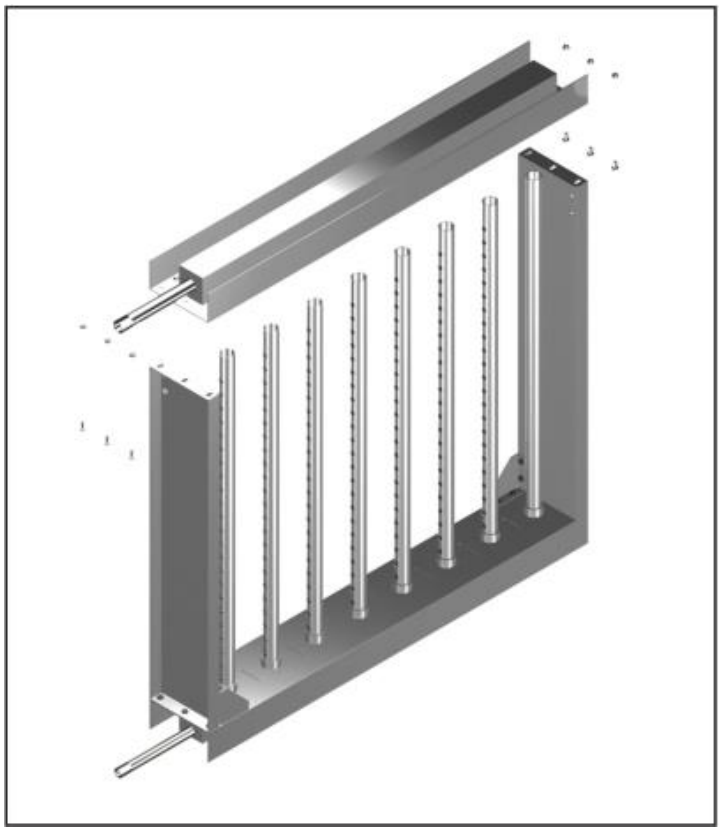


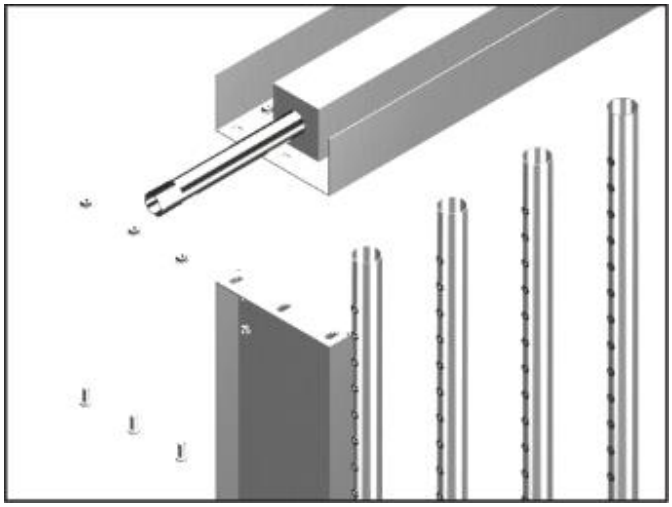


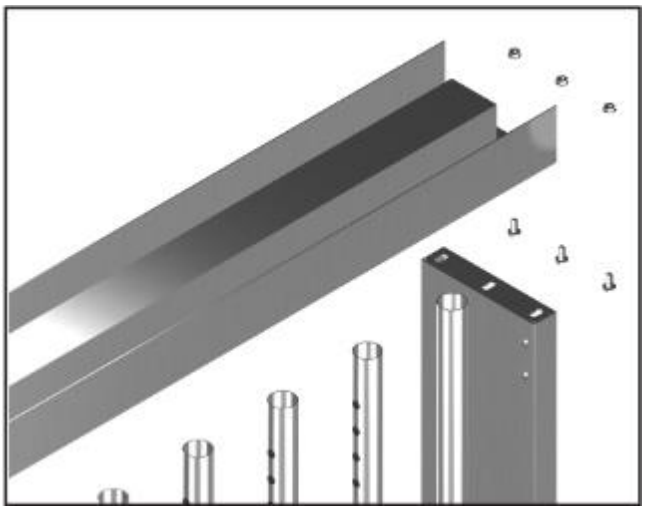
5. Place the upper head on top of the two side support plates and insert the dispersion tube in position, pushing it carefully.

   Insert it carefully so as not to damage the washers. We recommend applying an appropriate lubricant through the upper part of all dispersion tubes

   Secure them loosely using the M8 bolts and nuts. Do not apply the final tightening yet.

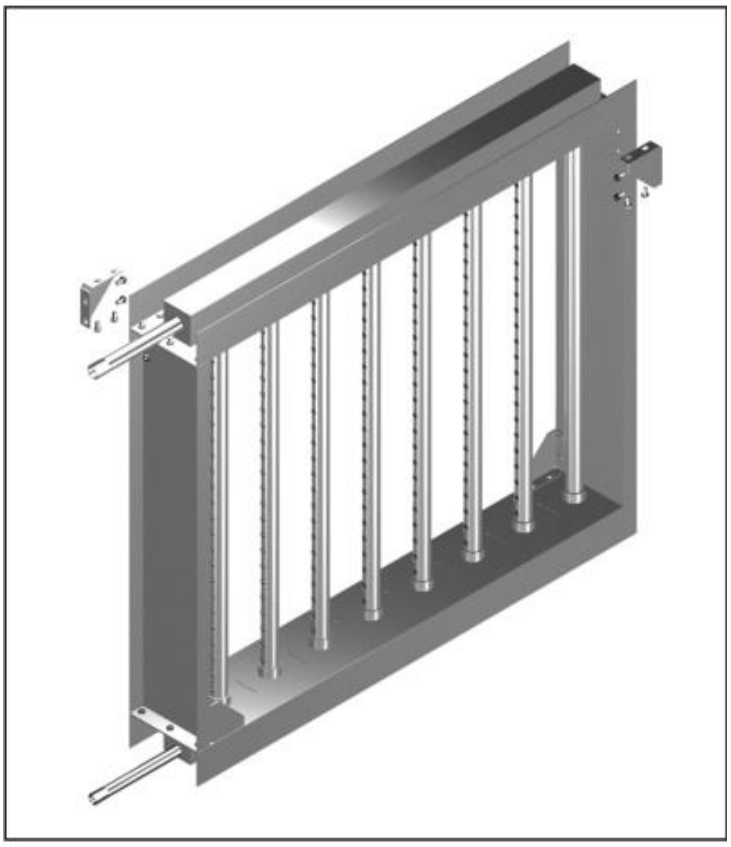


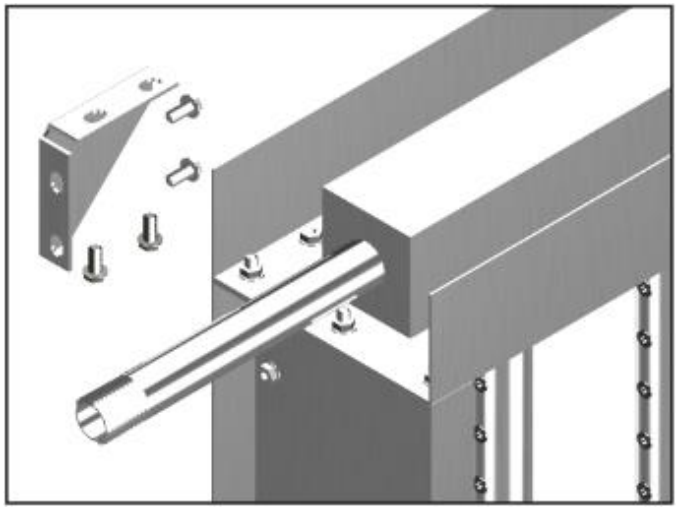


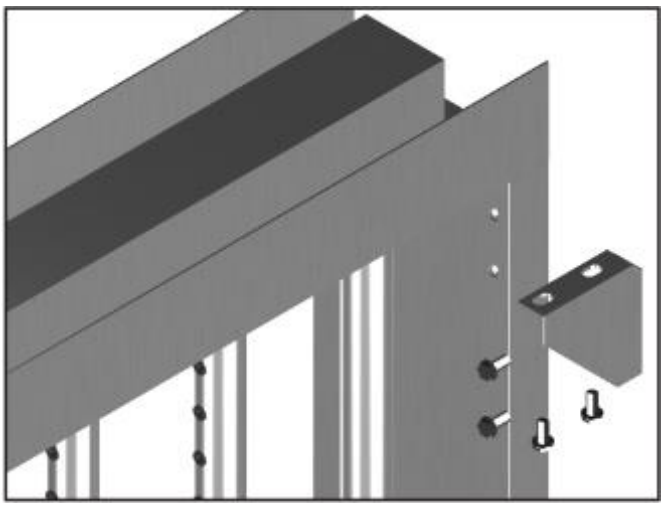


6. Place the brackets on the top header against the two side plates.

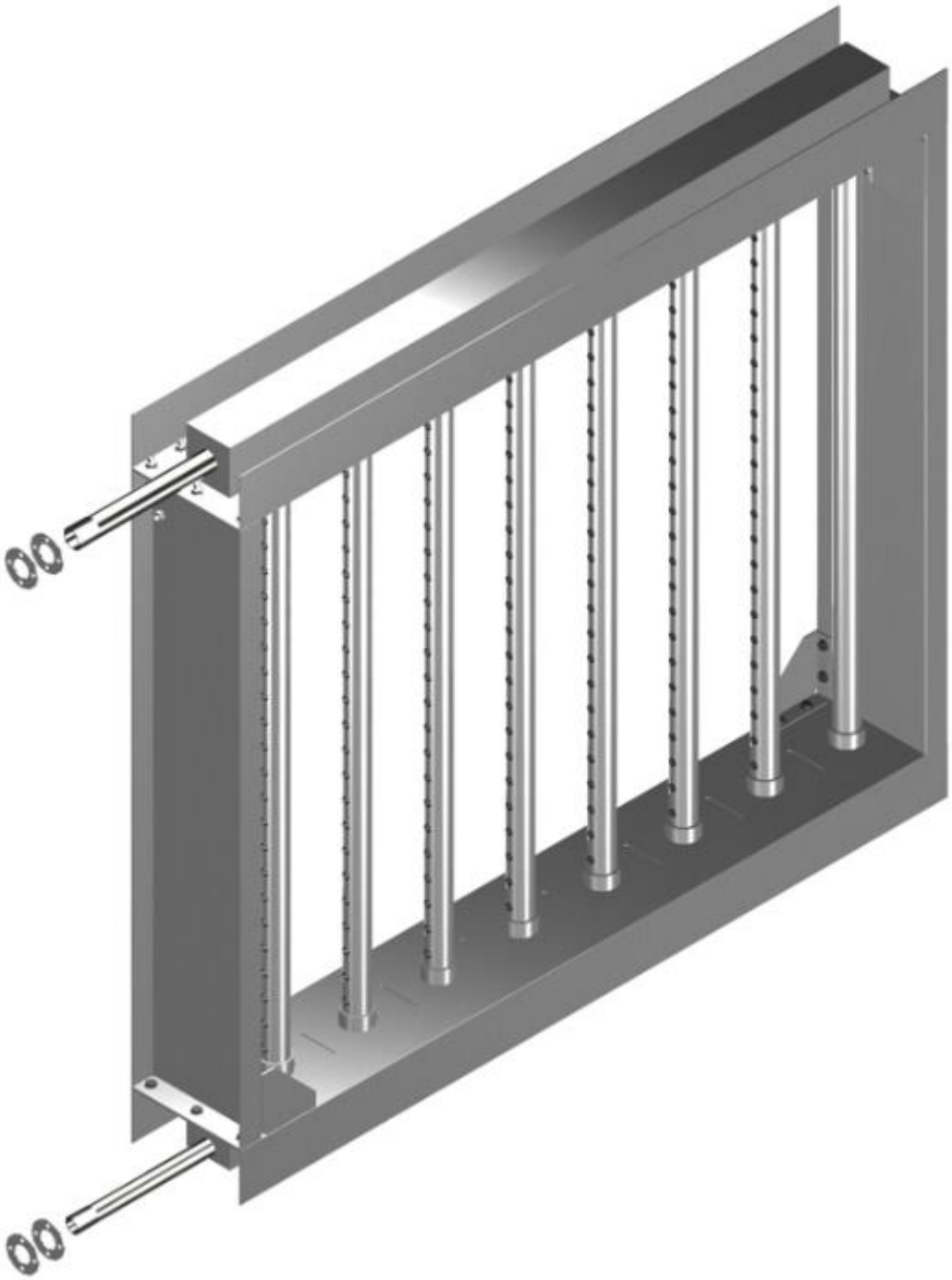
   Secure them loosely using the M8 bolts and nuts. Do not apply the final tightening yet.





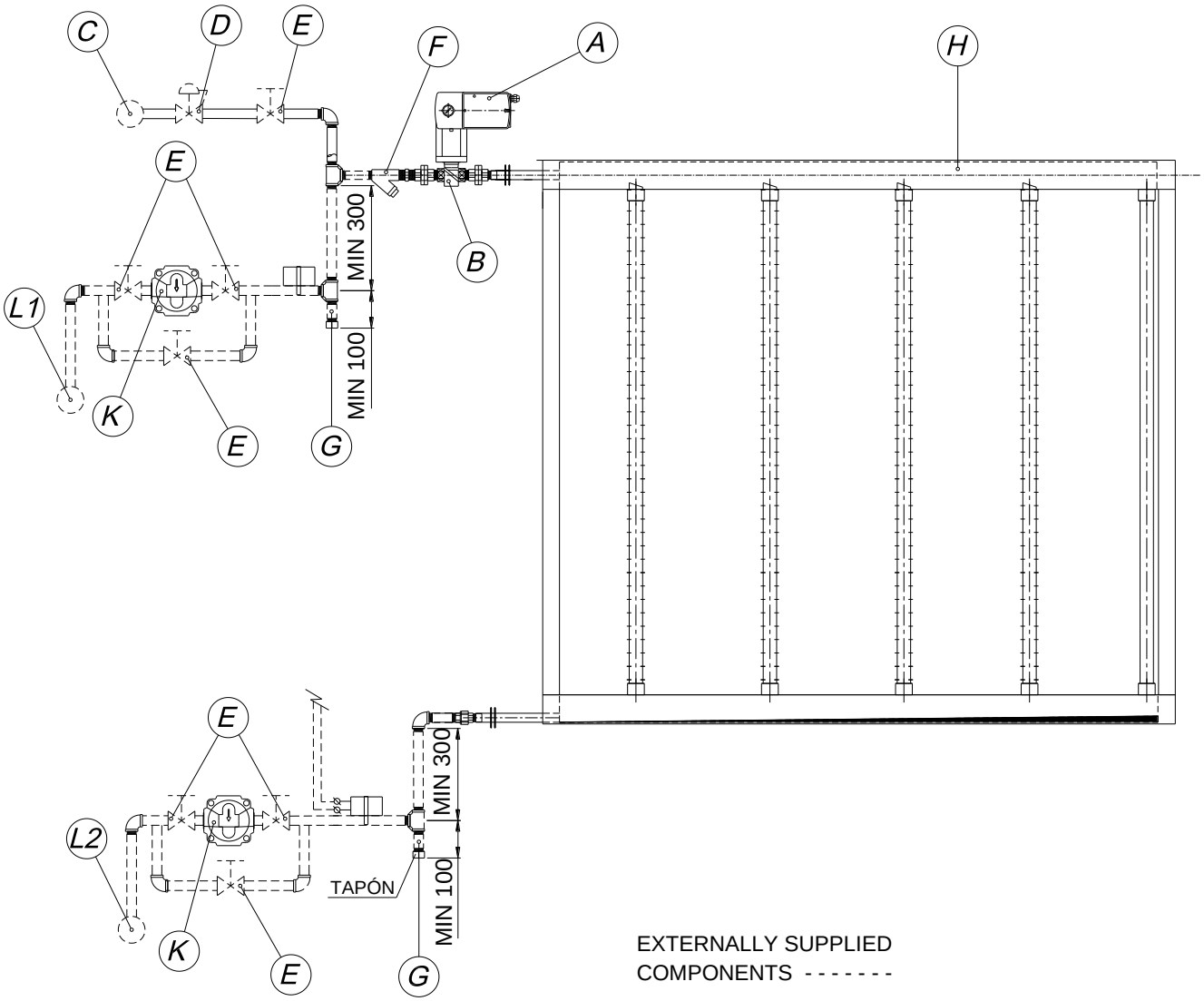


7. Check the MT2 is properly aligned and fully tighten the screws and nuts.
   Check all the dispersion tube nozzles are at 90º to the air flow.



10 Installing recommended tubing

10.1 Pressurized steam



A	Valve actuator	G	Drip leg
B	Regulating valve	H	MT2
C	Boiler steam (pressurized)	K	Steam trap
D	Pressure regulator	L1	Condensate line (pressurized)
E	Cut-off Valve	L2	Condenstate line (non-pressurized)
F	Filter in “Y”		

- The main steam supply for the humidifier must come from a height above or at the same level as the humidifier, not below, to ensure the driest steam. The main steam line supply must contain a condensate trap and drain according to the regulations.

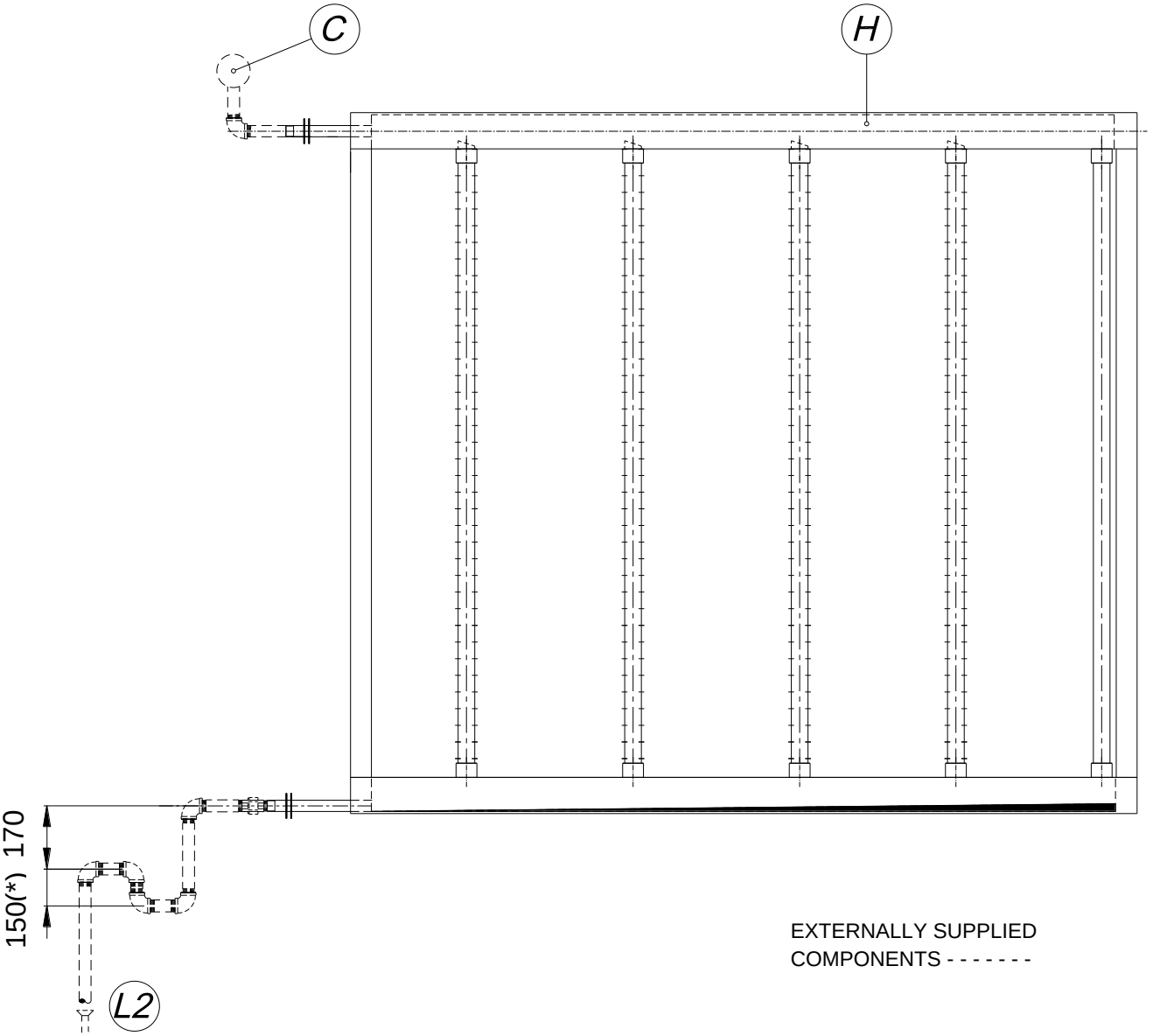
- A hygrostat set to 80-90% RH should be installed when the temperature in the duct is below 21°C. The hygrostat must be placed downstream to ensure the air has absorbed the injected steam.

- The humidifier F&T steam trap must empty by gravity to the main return with little or no back pressure. If the condensate cannot be drained by gravity, it must be raised to return to the main return flow.

- All recommendations for the application of DIPHUSAIR series are based on tests and field experience. However, these recommendations are based on duct air velocities, pressures and temperatures that are most encountered, and the recommendations may have to be modified when air flow velocities or pressures are high and/or air temperatures low. We also reserve the right to modify recommendations without notice if subsequent test or experience indicate that a change should be made. For the reason we urge you to check all applications with your FISAIR contact before installation.

10.2 Non-pressurized steam

10.2.1 Recommended general installation



C	Non-pressurised steam
H	MT2
L2	Condensate line (non-pressurised)

(*) A 250 mm siphon height is recommended (this height depends on the positive or negative pressure of the air flow)

It is important that the dispersion system is placed where there is no possibility of condensation in the duct; neither upstream nor downstream. In general, the best position is after the heating coil or in the area where the temperature is higher, since, with high temperatures, the absorption distance is shorter.

It should not be placed near a filter, or where the flow can hit a metal surface head-on, or where it can affect the firefighting or smoke detection system.

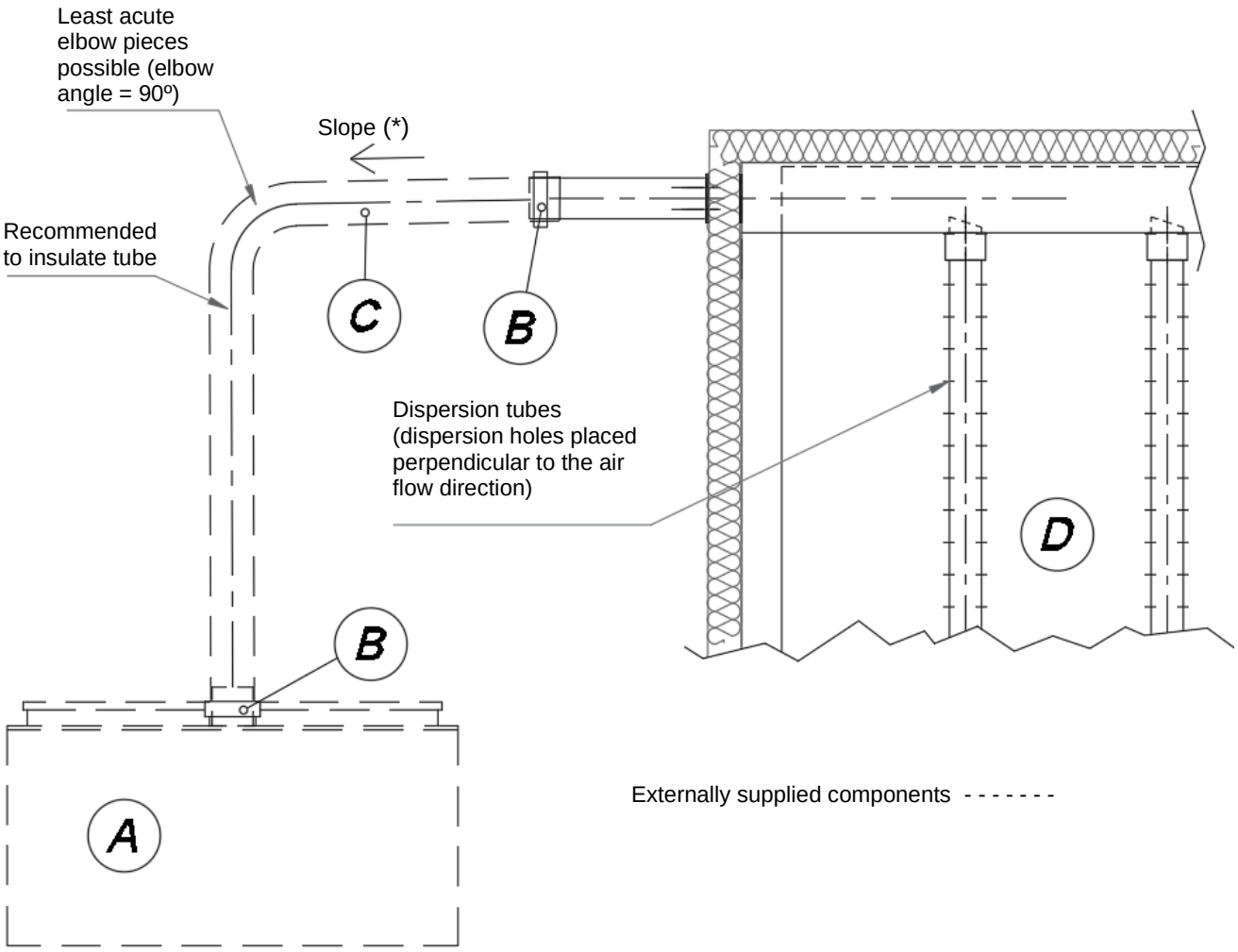
All recommendations for the application of DIPHUSAIR series are based on tests and field experience. However, these recommendations are based on duct air velocities, pressures and temperatures that are most encountered, and the recommendations may have to be modified when air flow velocities or pressures are high and/or air temperatures low. We also reserve the right to modify recommendations without notice if subsequent test or experience indicate that a change should be made. For the reason we urge you to check all applications with your FISAIR contact before installation.

Nota 1: A minimum distance of 2.5 m must be maintained between filters and dispersion systems. In any case, contact FISAIR for this type of installation since the useful life of the filters can be reduced by half, when working with high RH.

Note 2: It is not recommended to install the disperser in areas where the air flow has a pressure greater than or equal to +500Pa (positive pressure), -500Pa (negative pressure). Contact Fisair for other pressures.

Note 3: If the dispersion system is placed too close to the turbulent flow generated by a fan (<4m), the absorption capacity (kg / h) and distance can be seriously affected.

10.2.2 MT2 above the generator

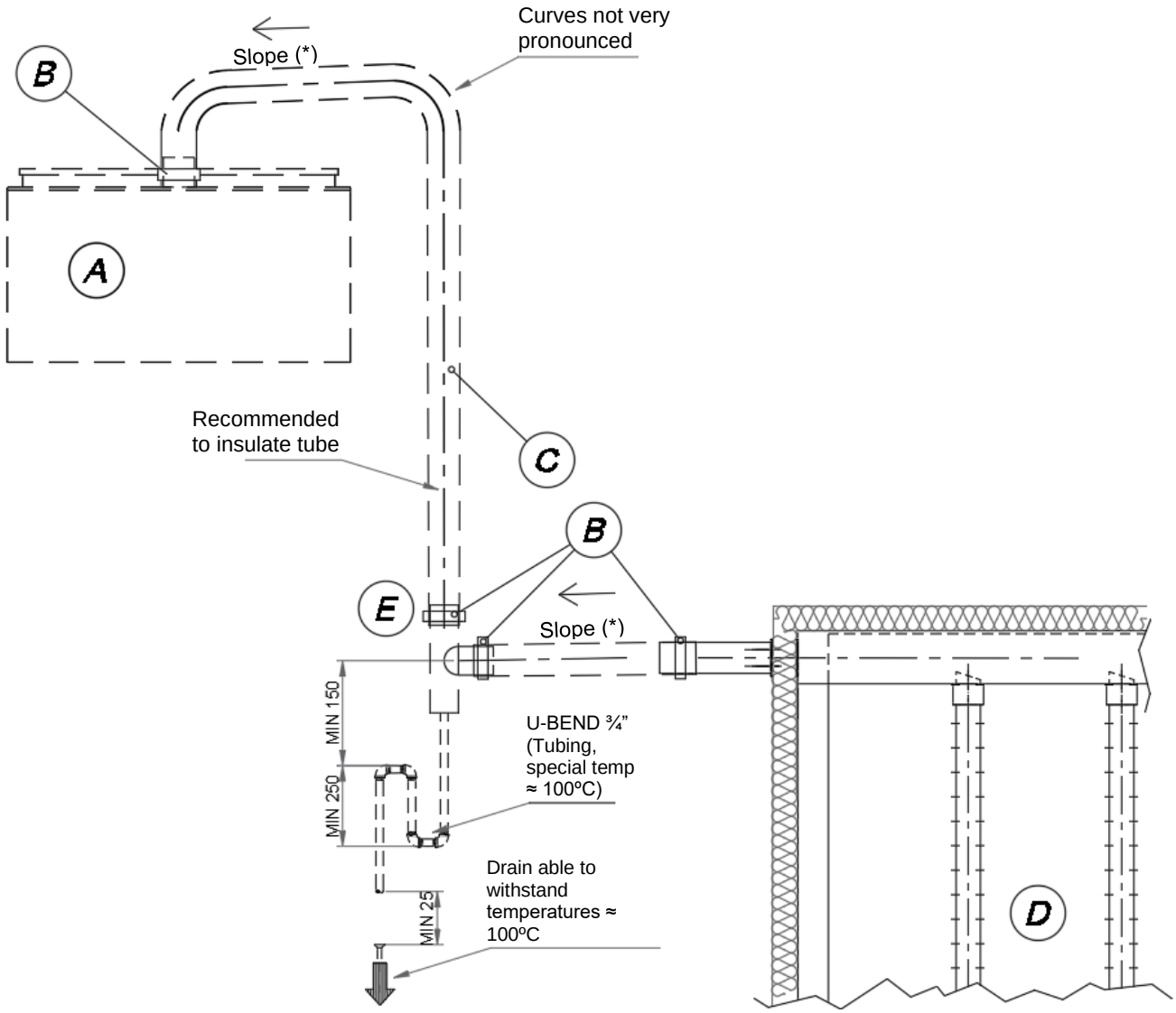


(*) Minimum slope towards the steam generator:

- With flexible steam tubing; 15%
- With rigid tubing; 2%

A. STEAM GENERATOR
B. CLAMP (X2)
C. SPECIAL FLEXIBLE STEAM PIPE
D. MT1 SYSTEM

10.2.3 MT1 under the generator



A. STEAM GENERATOR

B. CLAMP (X2)

C. SPECIAL FLEXIBLE STEAM PIPE

D. MT1 SYSTEM

E. CONNECTION "T"

Externally supplied components - - - - - - -

(*) Minimum slope towards the steam generator:

- With flexible steam tubing; 15%
- With rígida tubing; 2%

10.2.4 Tube to be used for the connection between the steam generator and MT2 (NP) dispersion system.

A special flexible hose for the steam should be used. No more than 3m of flexible hose should be used between the steam generator and the DIPHUSAIR MT2 (NP) dispersion system.

Flexible steam hose			Rigid copper or stainless steel tube		
Size ∅ [mm]	**Maximum capacity [Kg/h]**	**Maximum recommended length [m]**	**Size ∅ [mm]**	**Maximum capacity [Kg/h]**	**Maximum recommended length [m]**
25	25	Recom 3, max 5	25	23	5
40	65	Recom 3, max 5	40	60	7
50	123	Recom 3, max 5	50	120	8
76	200	Recom 3, max 5	76	204	22
104	340	Recom 3, max 5	104	320	28

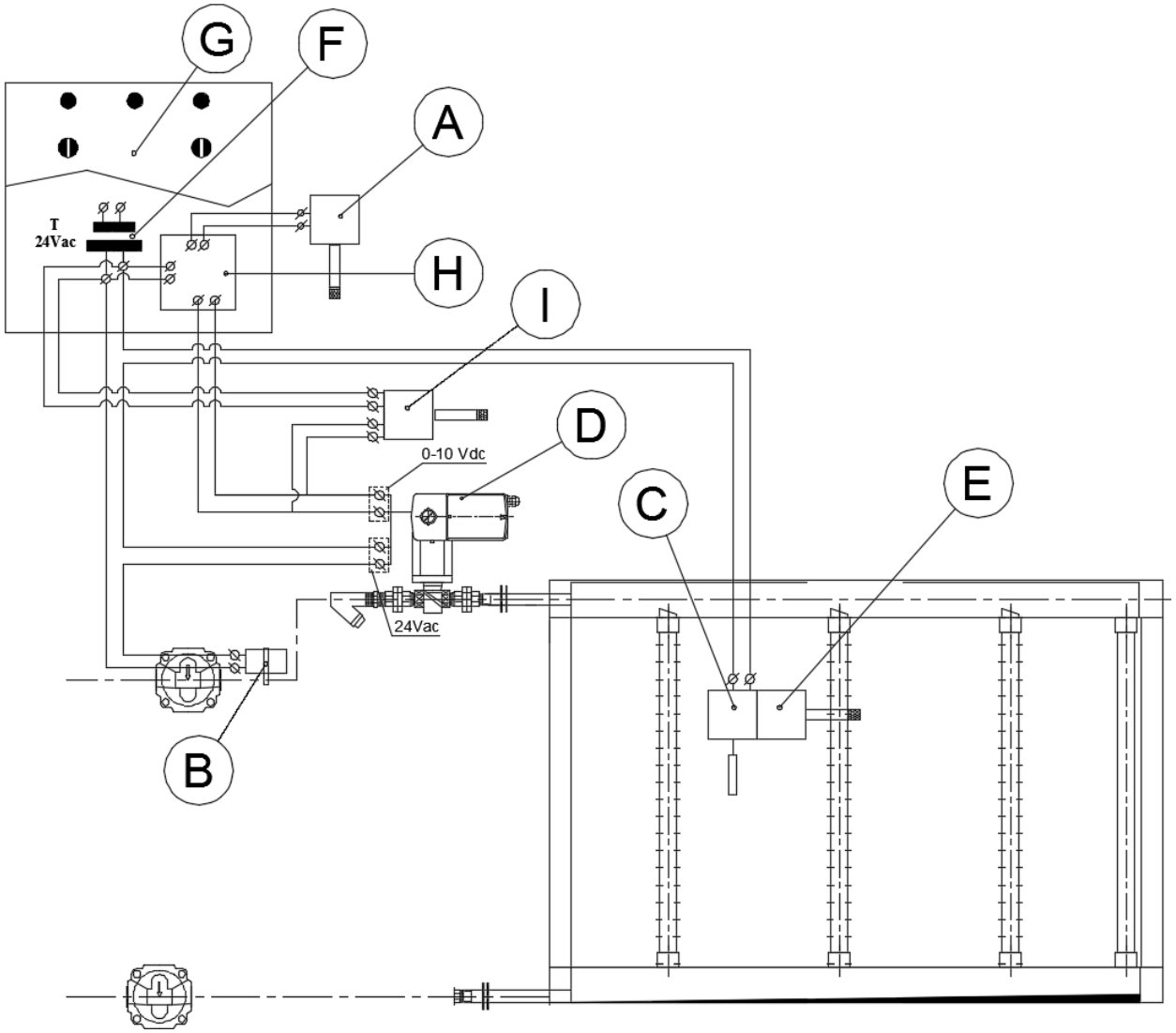
1. Use FISAIR flexible tubing for the best results. Other tubing may last less time or may cause foaming in the evaporation chamber, resulting in condensate discharge into the dispersion system. Do not use flexible tubing for outdoor applications.
2. The maximum recommended length is 5m, as longer lengths can cause the tube to twist or create lower points.

Description	**Size∅ [mm]**	**Steam losses [kg/h/m]**		**Insulation thickness [mm]**
		No insulation	**Insulation**	
Flexible tubing	25	0.20	-	-
	40	0.25	-	-
	50	0.32	-	-
	76	0.41	-	-
	104	0.53	-	-
Rigid tubing	25	0.18	0.028	50
	40	0.20	0.033	50
	50	0.27	0.040	65
	76	0.36	0.049	65
	104	0.49	0,061	75

Note: Data taken at room temperature of 25°C

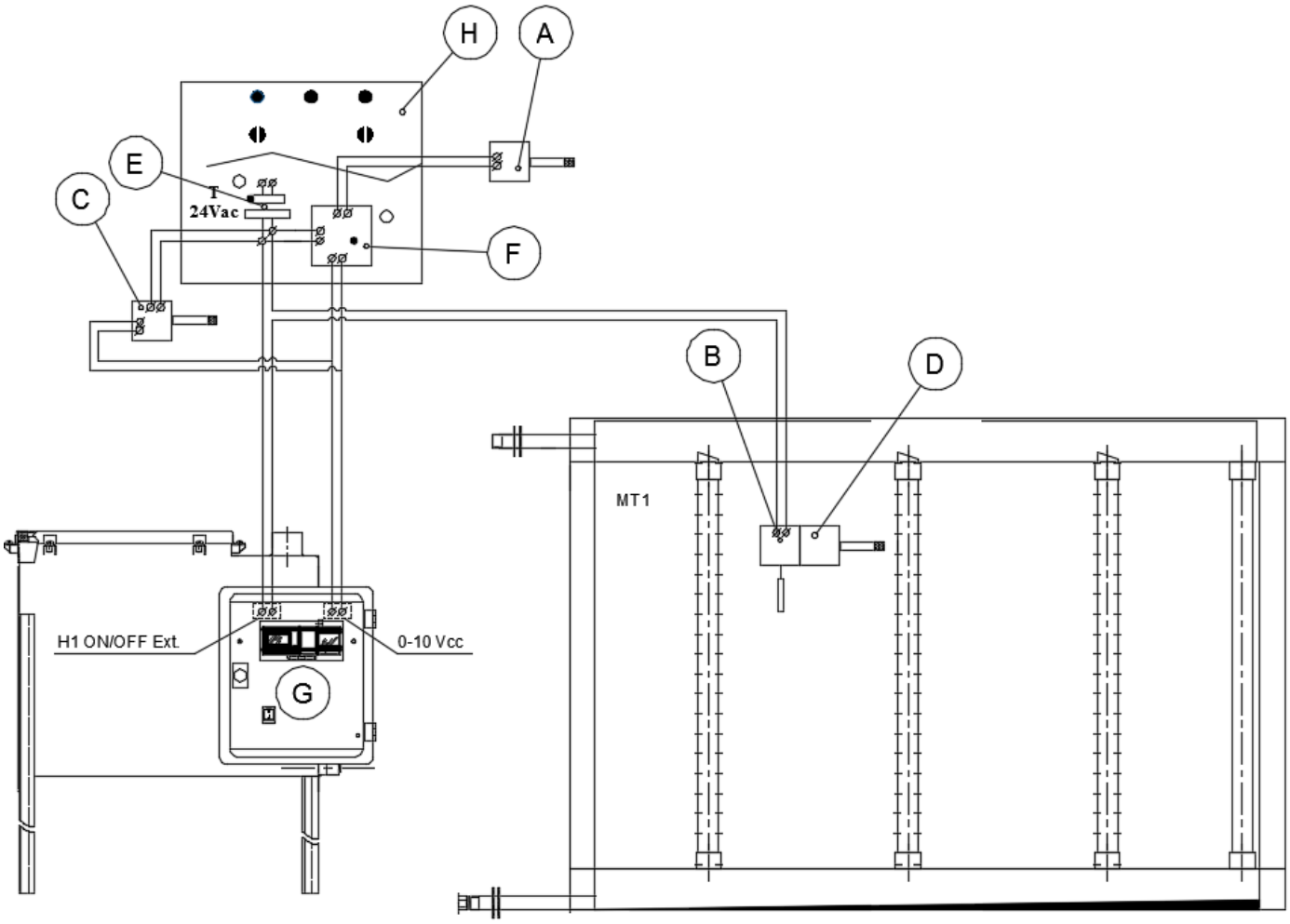
11 Recommended electrical installation for MT2 (P)

11.1 Pressurized steam



A- DOUBLE ACTIVE PROBE (TEMPERATURE AND HUMIDITY R.H.), FOR DUCT/AHU OR ROOM
B- NON-DRIP SAEFTY THERMOSTAT
C- FLOW SWITCH
D- ACTUATOR VALVE
E- MAXIMUM HUMIDITY CUT-OFF HYGROSTAT
F- TRANSFORMER
G- CONTROL PANEL (BMS/AHU)
H- HUMIDITY REGULATOR
I- HUMIDISTAT (RH) WITH ENVIRONMENTAL/ROOM OR DUCT/ATU ACTIVE PROBE

11.1 Non Pressurized steam

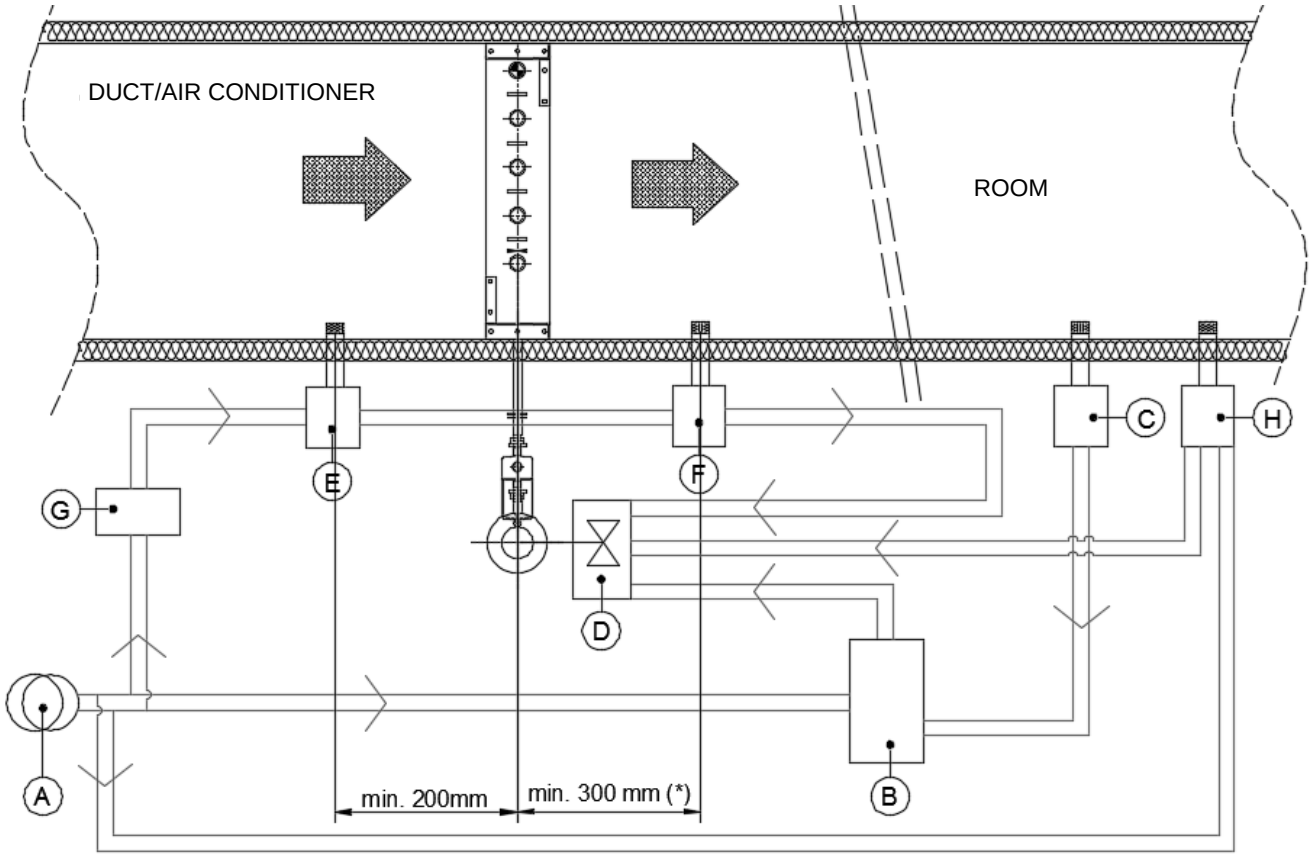


A- DOUBLE ACTIVE PROBE (TEMPERATURE AND HUMIDITY R.H.), FOR DUCT/AHU OR ROOM
B- FLOW SWITCH
C- HUMIDISTAT (R.H.) WITH ENVIRONMENTAL/ROOM OR DUCT/ATU ACTIVE PROBE
D- MAXIMUM HUMIDITY CUT-OFF HYGROSTAT
E- TRANSFORMER
F- HUMIDITY REGULATOR (BMS/AHU)
G- CONTROL PANEL (Steam generator)
H- CONTROL PANEL (BMS/AHU)

12 Recommended sensor location

The location of the sensors has a significant impact on the operation of the humidifier. It is recommended not to exchange the duct sensors with the room sensors, since each is calibrated for a certain air velocity.

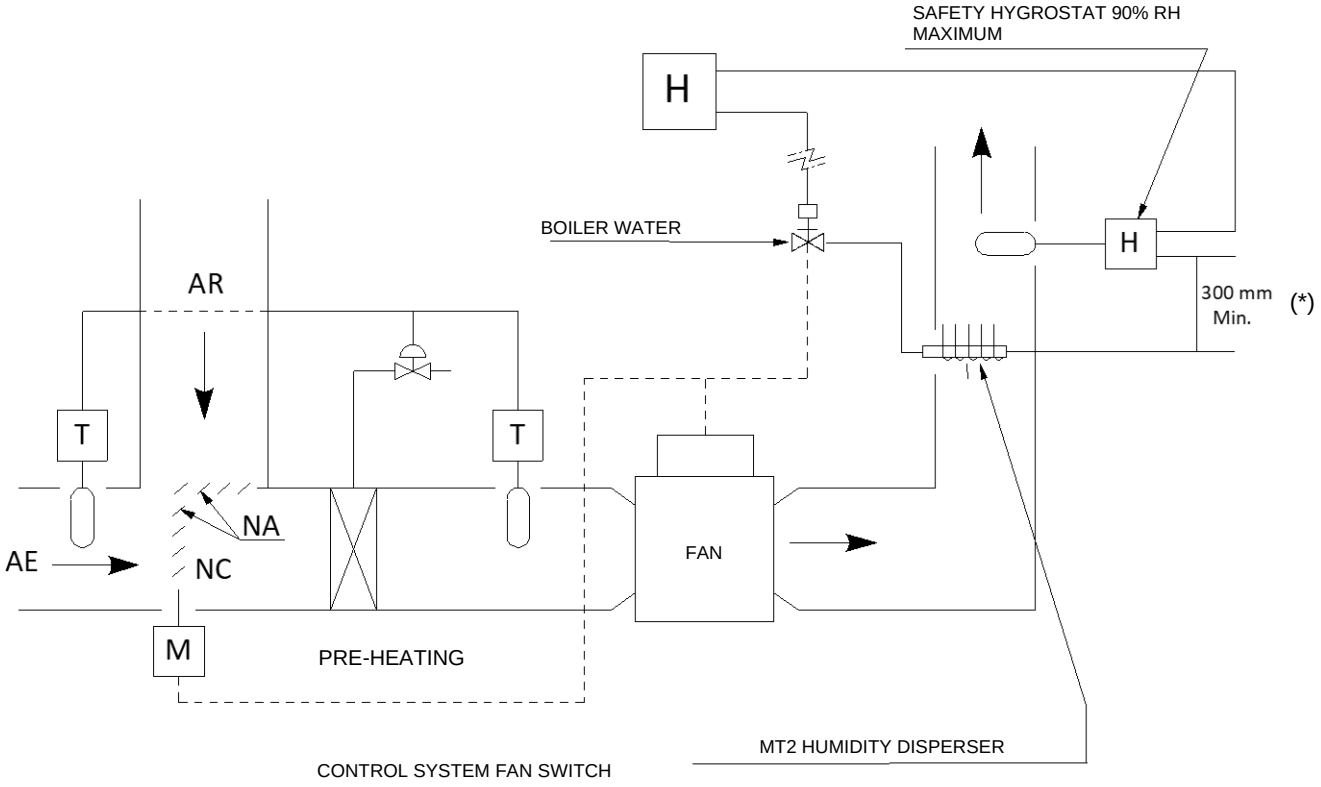
The proposed assemblies appear below. Some components must be supplied by the installer.



(*) Add to the absortion distance

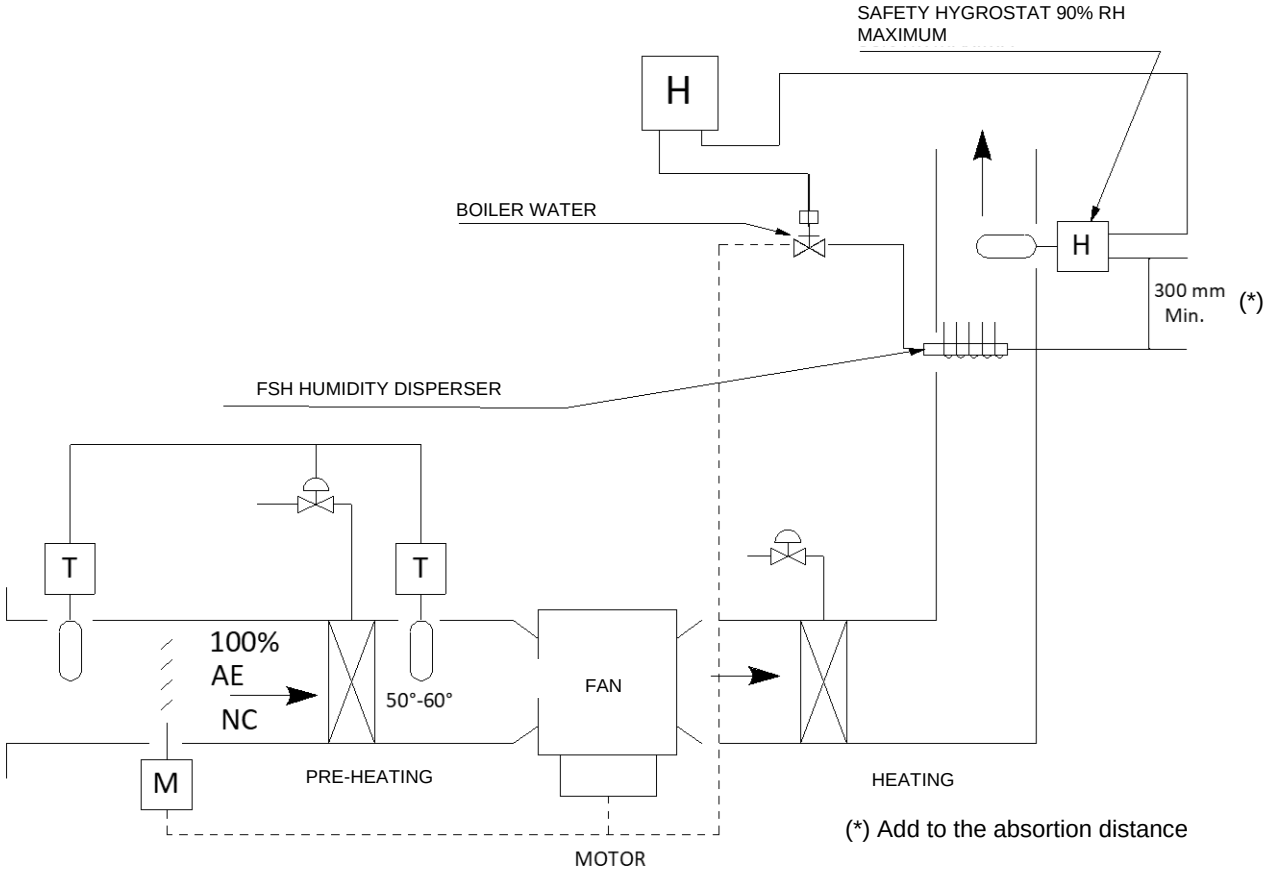
A	Transformer
B	Humidity Regulator
C	Double active probe (temperature and humidity R.H.), for duct/ AHU or room
D	Valve actuator or steam generator control panel
E	Flow switch
F	Maximum humidity cut-off hygrostat
G	Non-drip saefty thermostat (only for the case "pressurized steam" P)
H	Humidistat (R.H.) with environmental/room or duct/AHU active probe

DUCT INSTALLATION WITH RETURN AND EXTERIOR AIR WITH PRE-HEATING



(*) Add to the absortion distance

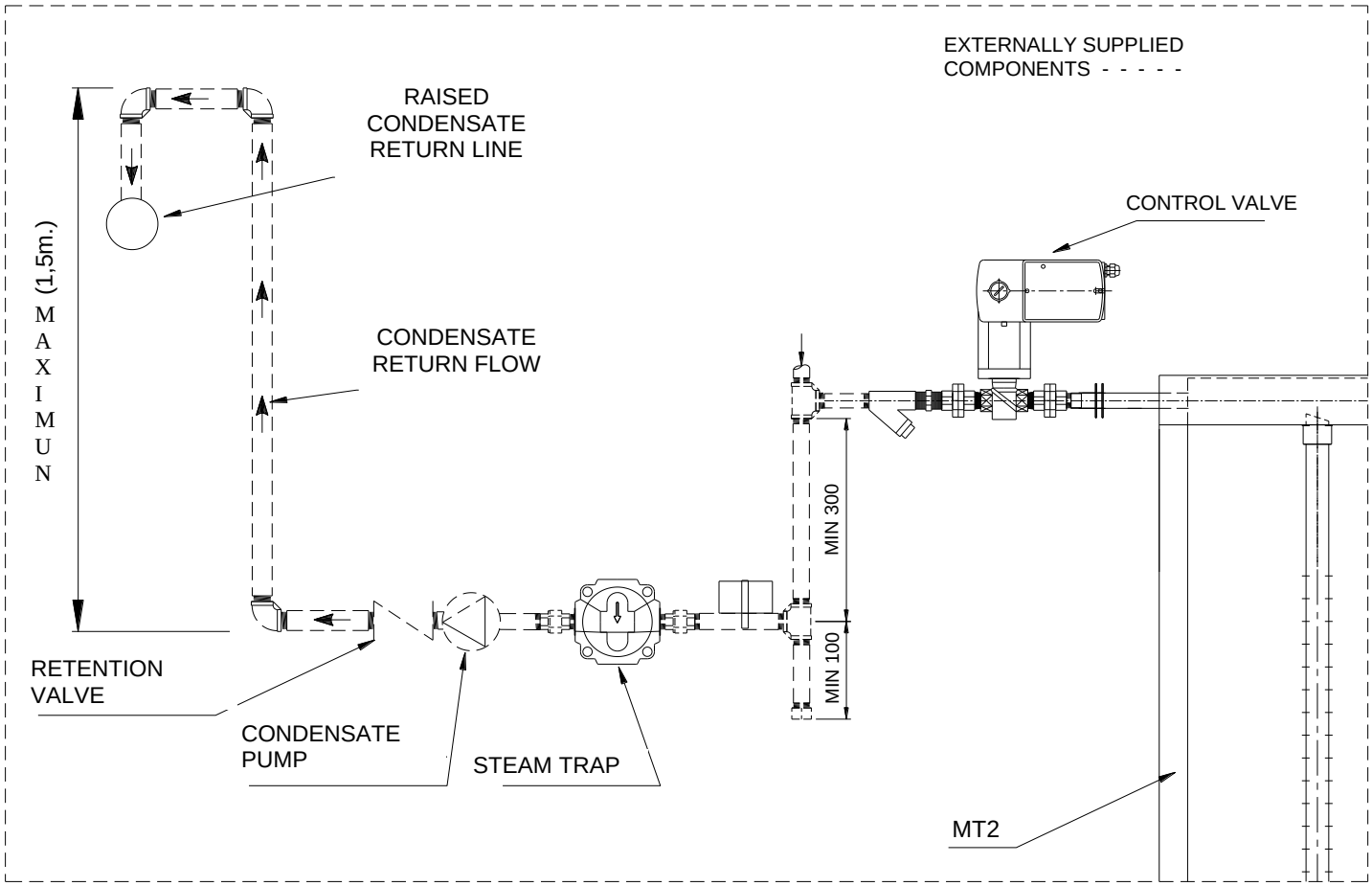
DUCT INSTALLATION WITH 100% EXTERIOR AIR AND 2 HEATING STATIONS



(*) Add to the absortion distance

13 Raising condensate

13.1 Pressurized steam line MT2 (P)



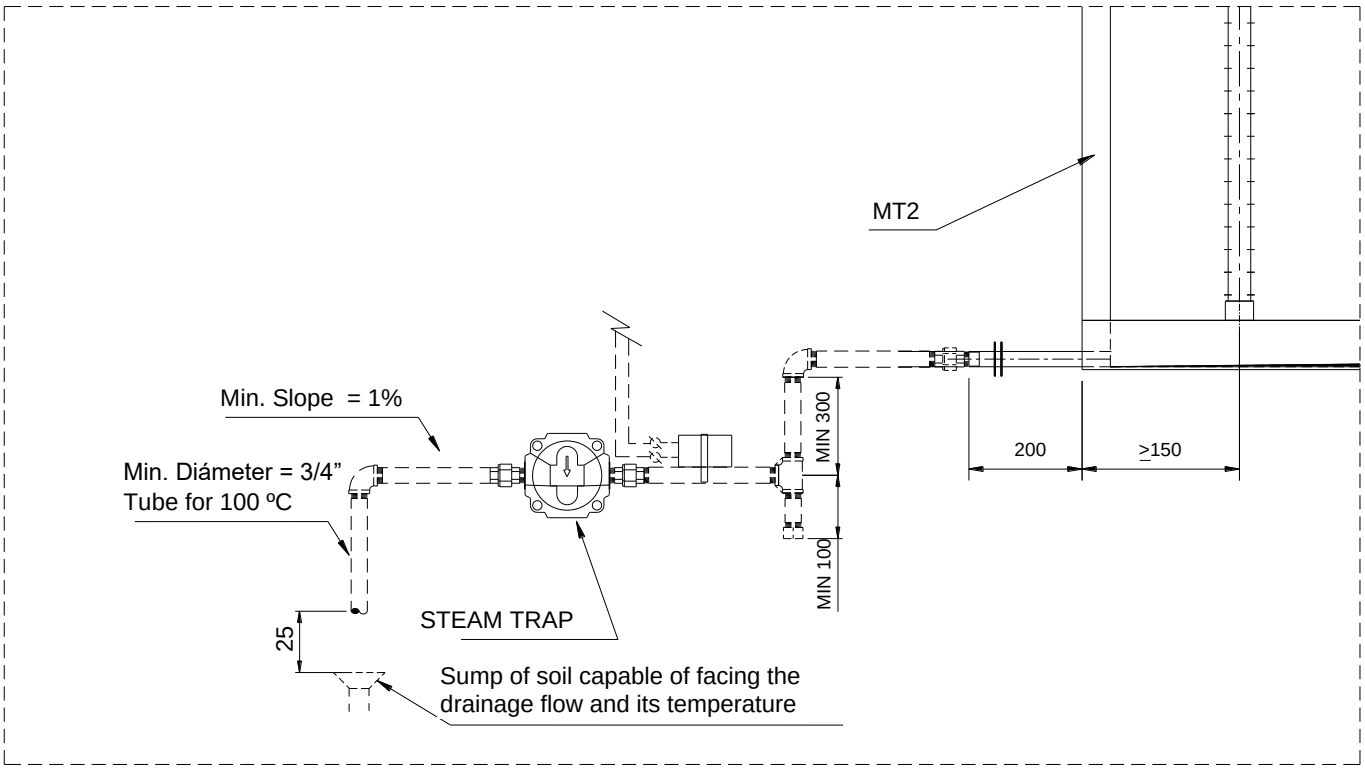
*****Note: Use a condensate pump only if necessary, as the steam pressure itself can lift the condensate up to 1.5m; with a condensate pump, a check valve must be installed.

14 Operating environment temperature and humidity

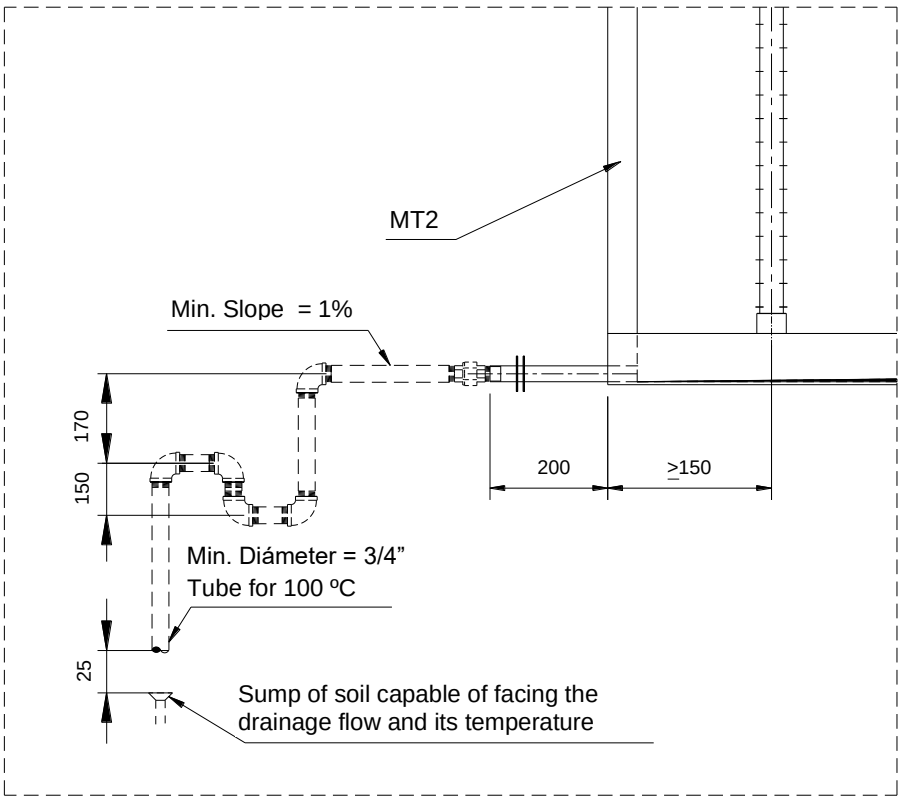
- Temperature: [-10…+40ºC]
- Relative humidity: [5...95% RH] no condensation.

15 Connection of the non-pressurized condensate line

15.1 By Trap (MT2 pressurized steam)

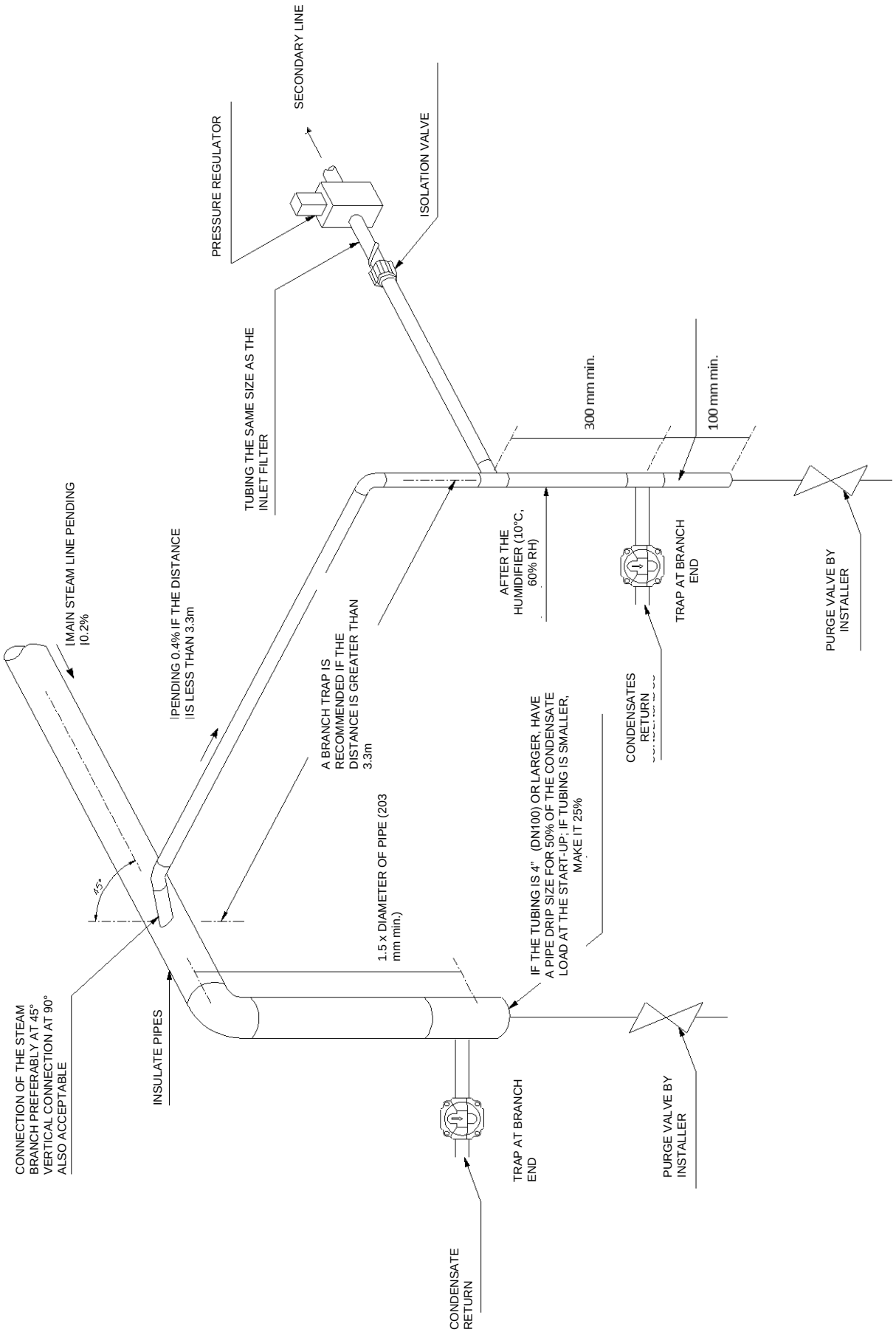


15.2 By P-Trap (MT2 non-pressurized steam)

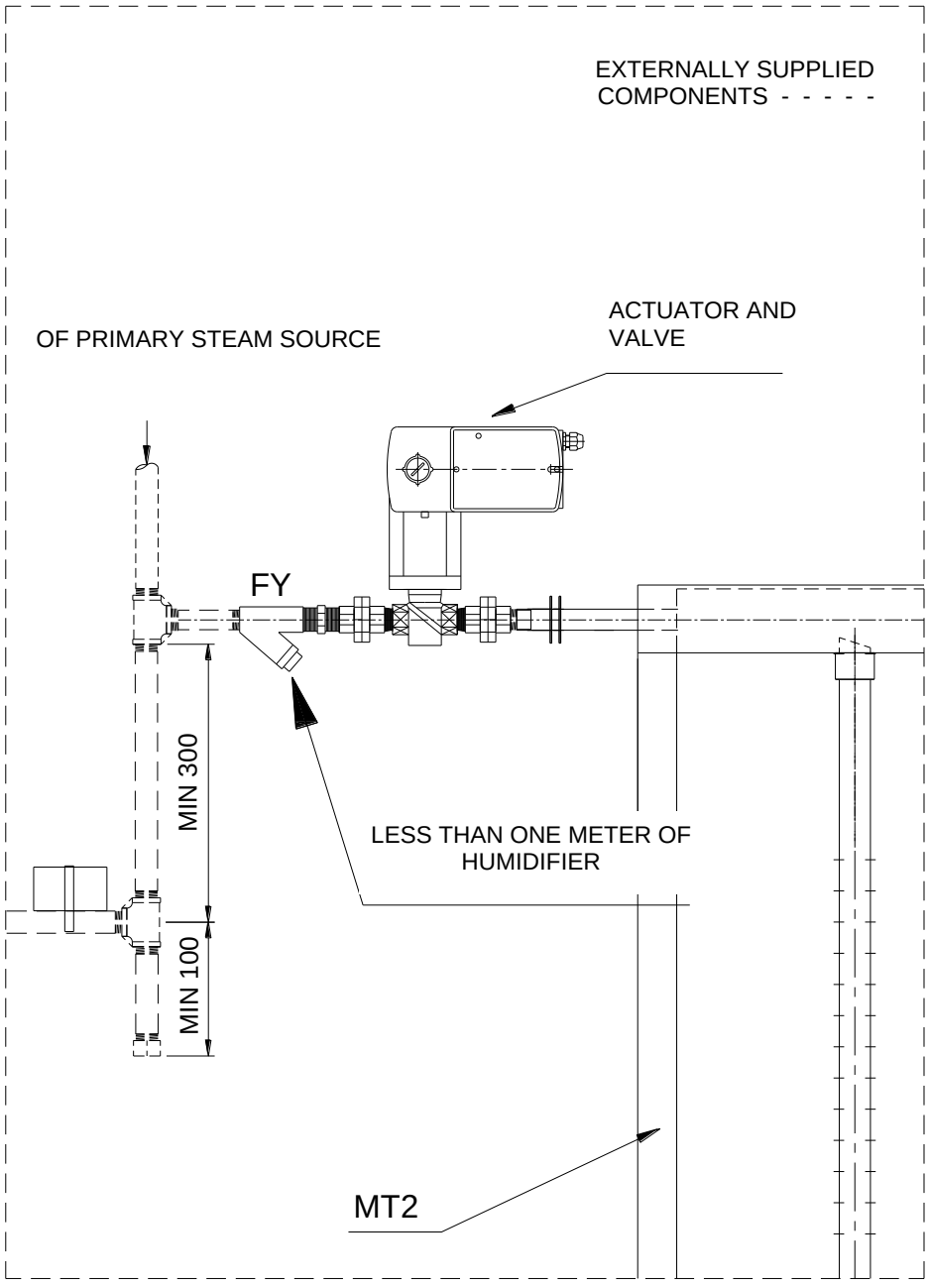


16 Connection to boiler steam line

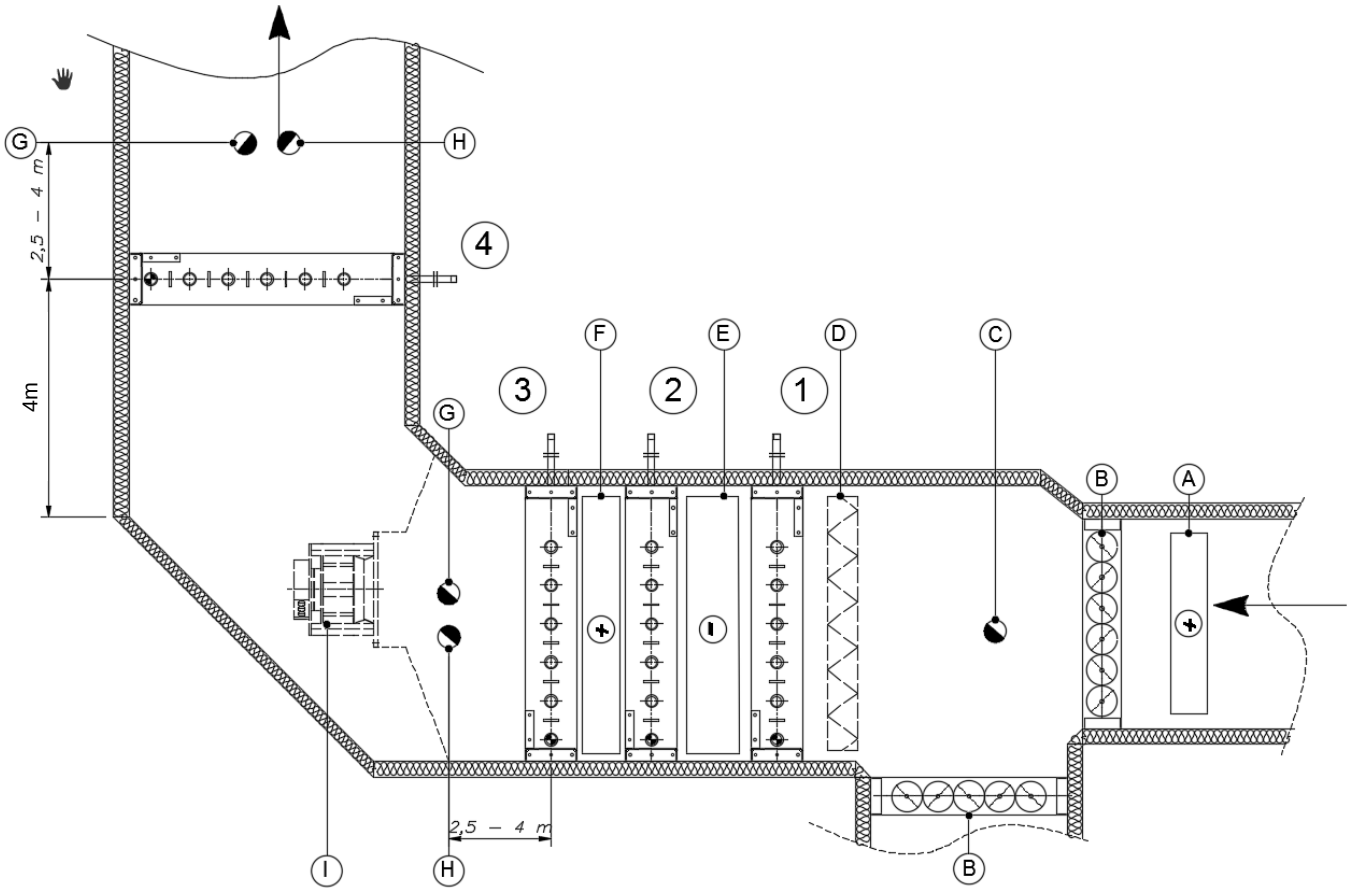
16.1 Connection to main steam line



16.2 Connection of secondary lines to each dispersion system



17 MT2 located inside an AHU



A	Pre-heating coil	F	Heating coil
B	Dampers	G	Safety hygrostat
C	Control device	H	Air flow switch
D	Filter	I	Fan
E	Cooling coil		

Location 3:

This is the best option. Installing downstream from the heating and cooling coils, as it provides laminar flow through the dispersion unit, and the heated air absorbs the steam better. It is recommended to use MT2 to ensure complete absorption before entering the fan.

Location 2:

This is the second-best option, for overload periods, the cooling coil removes part of the moisture for humidification.

Location 4:

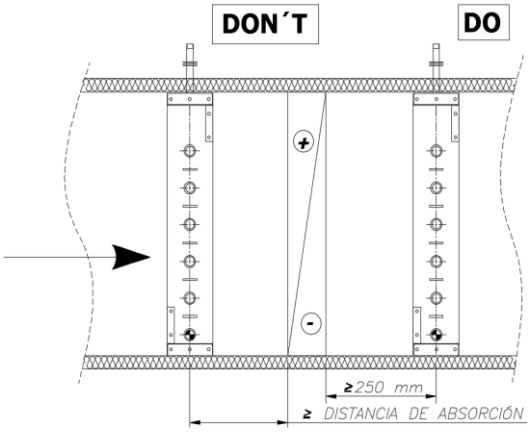
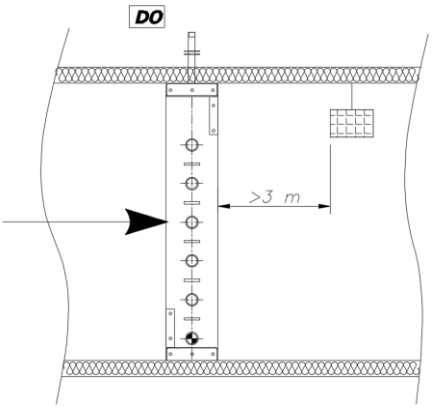
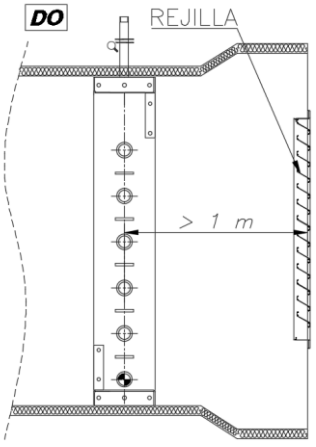
This is the third option. When the air leaves the fan, it is turbulent and the steam may not be absorbed within the established absorption distance. This gives more absorption distance if installing downstream from the fan. If the dispersion system is placed within 4 m of the turbulent flow, the absorption capacity (kg / h) and distance can be seriously affected.

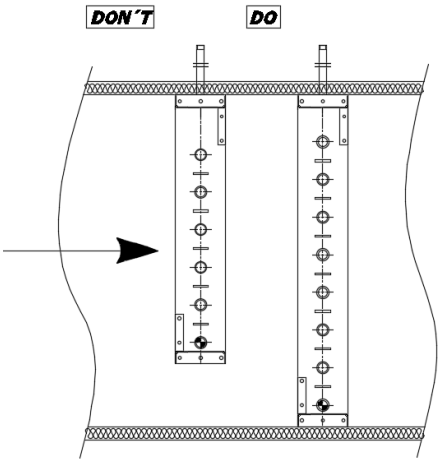
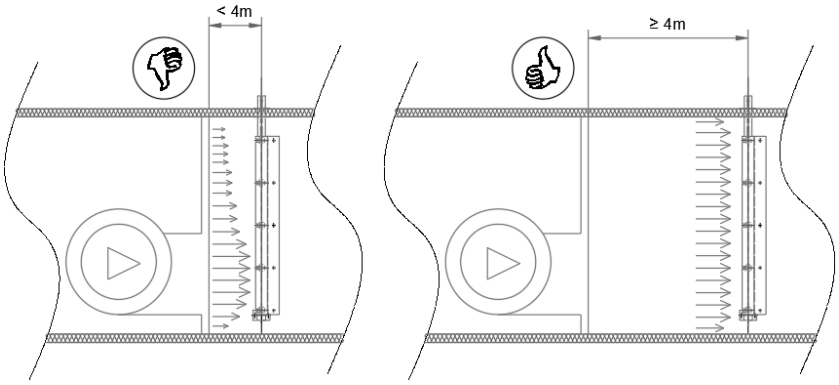
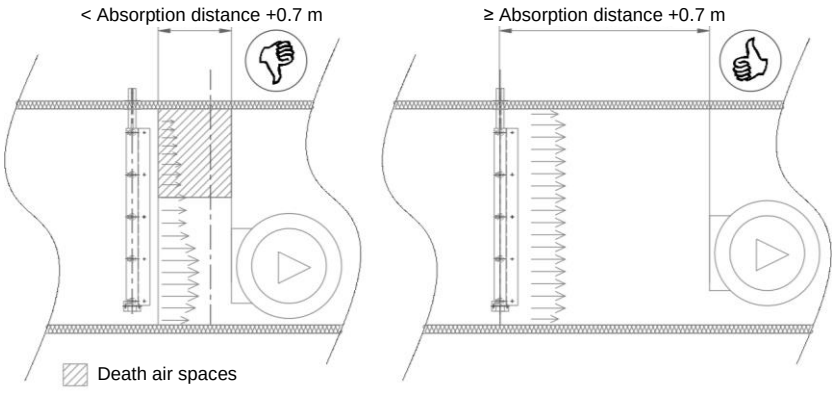
Location 1:

This is the least recommended position. The cooler air in this position requires a greater absorption distance.

In conclusion, the best location options are locations 2 and 3, downstream of the batteries, the best option being location 3, downstream of the heating coil. Try, as far as possible, to avoid close locations, downstream of fans and in locations with too cold air.

18 Notes to consider at the equipment site.

When possible, install the humidifier downstream of the coils. If there is more than 90cm of available distance between the MT2 and the coil on the upstream side, the humidifier can be installed at that location.	
Do not install the MT2 less than 3m upstream of the temperature controller as it may give an erroneous signal.	
Always install the MT2 as far as possible upstream of the air discharge grilles, and never less than 1m upstream.	

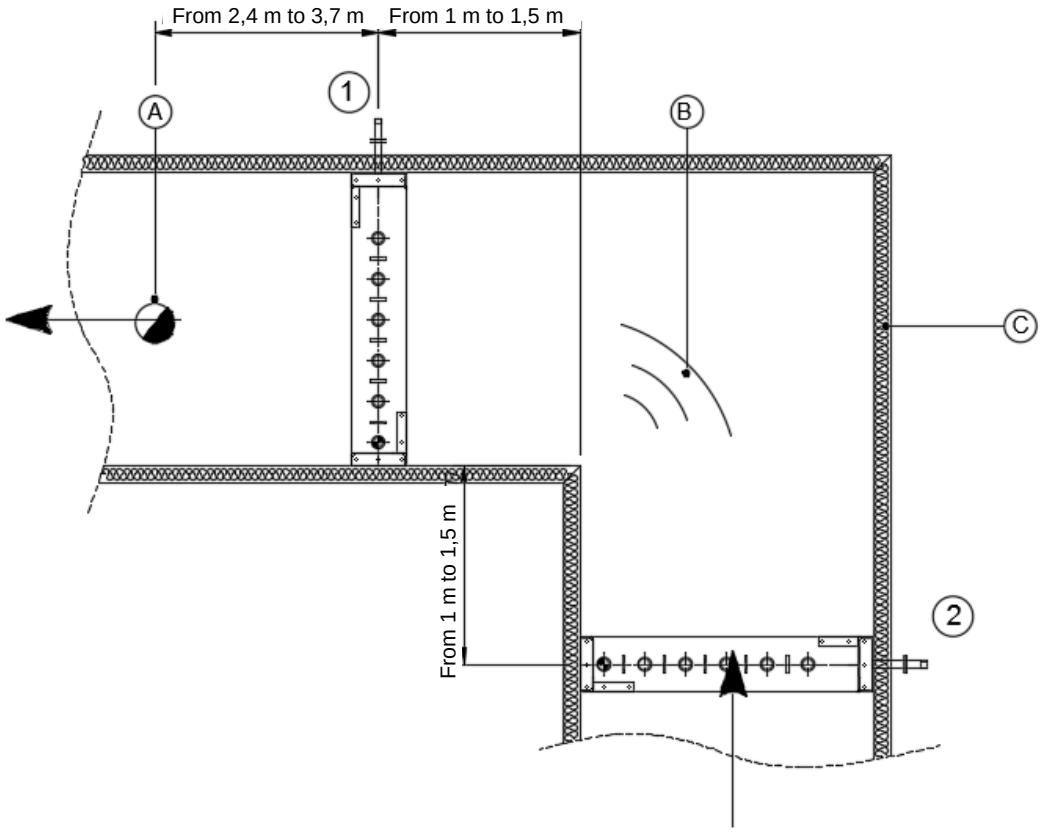
Always select the MT2 with the length that covers the width of the duct.	
The MT2 must have air flow across the entire cross section. Avoid fan discharges without gradually changing the section. If it is with pressures (+), place in the ducts after the AHU.	
The MT2 cannot have dead air space because it is too close the fan aspiration. Avoid fan aspiration without a good mixing zone.	

- Installing the humidifier near an elbow:

  Position 1: This is the best option. It leads to better absorption downstream from the elbow.

  Position 2: This is the second best option. Moisture may collect on the elbows of the duct. Where it is structurally impossible to avoid this position, use MT2 to ensure complete absorption. Try to place it 1-1.5m from the elbow.

A	Hygrostat
B	Duct elbow
C	Duct



19 Launching

1. Turn on the supply steam to the MT2:

    - Boiler Steam: Open the steam main valve.
    - Non-pressurized steam generator: Follow the start-up instructions in the corresponding Installation, Operation and Maintenance manual of the corresponding steam generator.

2. Check there are no leaks in the pipes.

3. Check installation and operation of the steam trap system (page 41 or 42).

4. Check if the dispersion tubes are leaking.

    Note: Any condensate leakage at either end of the dispersion tube could be caused by missing/damaged O-rings.

5. Make sure the dispersion tubes and manifolds are oriented at 90° with respect to the air flow.

6. Check there are no other leaks in the steam and drain connections.

7. Make sure the steam trap/ P-trap is working.

    - At the beginning of the operation cycle, make sure there is a flow of condensate drain water when running:

        1. If not, check the trap is not blocked.
        2. Check the trap height is enough to overcome the air flow pressures.
        3. Static duct pressures > 650 Pa may require a higher P-trap.

IMPORTANT Request start-up of your units by contacting:

sat@fisair.com o service@fisair.com

https://fisair.com/es/servicio/puestas-en-marcha/ (application in Spanish)

https://fisair.com/service/start-ups/ (application in English)

20 Maintenance

- The equipment requires regular inspection; if not, it could damage the components and invalidate the guarantee. Keep in mind that the equipment can be contaminated, and must be controlled to prevent this.
- The humidifier should be sterilised twice a year.
- The humidifier must be inspected monthly to ensure its proper operation, and that it has no difficulty requiring immediate correction.

COMPONENT	FRECUENCY AND PROCEDURE
Filter in Y	Inspect at least twice during the first year. If it is dirty, it should be inspected more frequently and cleaned as necessary.
Steam trap	At least twice a year, verify that it works correctly: - If it is blocked, the trap will be cold. - If a malfunction causes steam to escape, the trap will be hot and make a noise. - The trap is operating properly if it leads to a drop of approx 1°C through it.
Valve	Inspect annually to make sure: - The valve operates freely - The valve completely stops steam from passing There are no leaks
O-rings	Inspect them every three or four years of service, replace them if necessary.

IMPORTANT Request maintenance of your units by contacting:

sat@fisair.com o service@fisair.com

https://fisair.com/es/servicio/mantenimientos/ (application in Spanish)

https://fisair.com/service/maintenance/ (application in English)

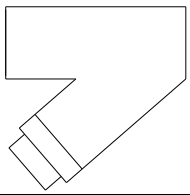
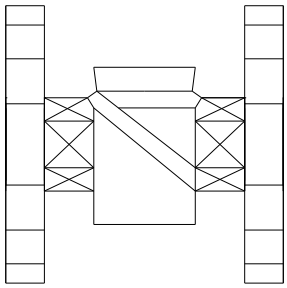
21 Troubleshooting

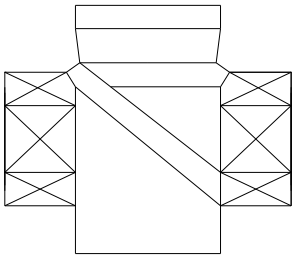
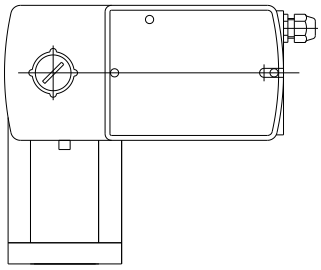
PROBLEM	POSSIBLE CAUSE	ACTION
The humidifier discharges water into the duct.	Main steam line overloaded with water due to discharge of water and steam from the boiler or inadequate purging of the main steam line.	- Locate cause and correct it.
	The trap does not drain properly.	- Replace, clean or repair trap, as required. - Reduce condensate return line pressure.
	Steam pressure is very low.	- Check the shut-off valves are fully open. - Adjust the pressure regulator. - Adjust the boiler pressure
	Condensates are being collected at low points, without purging, from the main steam line.	- Install drip legs or traps as required.
	Improperly placed humidifier	- Correct the position of the humidifier
	Condensate return line overload.	- Install drip legs or traps as required.
	Trap capacity inadequate.	- Replace with larger trap.
Water leaks from the humidifier.	Defective links.	- Replace links.
Humidity exceeds the hygrostat value.	The automatic valve does not close completely.	- Something prevents the valve from closing. Clean it; check the filter. - The steam pressure exceeds the valve spring closing value. - The valve is installed in reverse. Re-install it. - Adjust the valve link.
	The control system does not work properly.	- Incorrect control voltage. Check and correct. - Incorrect control signal. Check and correct. - Incorrect connection. Check and correct. - Incorrect humidity sensor. Check and correct. - Humidity controller not calibrated. Calibrate.
	Steam leak inside the duct.	- Repair leak.

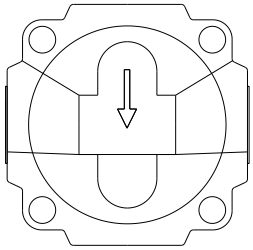
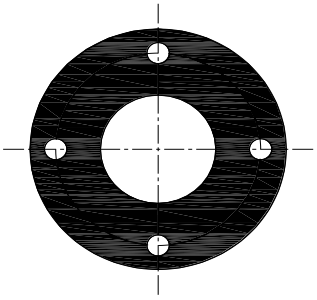
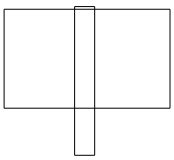
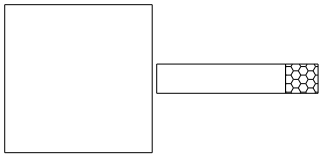
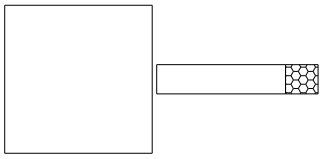
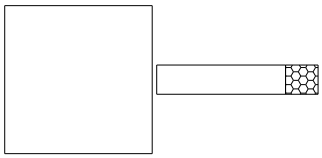
	The electrical control system does not work properly	- Calibrate it or replace it
	Incompatible control components	- Replace them with specific recommendations
		- The humidification capacity is oversized. Switch to a smaller valve - The valve does not accurately control the steam pressure. Change it or replace it - The boiler steam pressure fluctuates too much. Adjust it.
	Poor location of control components	- Relocate them by recommendation of the manual
Humidity fluctuates around the desired humidity set point.	The control system does not work properly.	- Humidity controller defective or inaccurate. Calibrate or replace. - Control components poorly located. Reposition. - Incompatible control components. Change components.
The humidity of the space does not increase to the humidity point established.	Excessive external air volume.	- Check fans, gates, etc. - Reduce air volume.
	Steam pressure is very low.	- The manual steam valve is partially closed. Open. - Clean filter. - Boiler pressure is very low. Adjust. - Pressure regulator does not work properly. Repair or correct. - Check fans, gates, etc. - The tubes are too small. Change.
	The humidifier is too small.	- Replace valve with one of greater capacity. - Replace with larger humidifier. - Add additional humidifier.
	The automatic valve does not open completely.	- It is too tight. Release or replace tightening. - Adjust links. - Check pilot position settings.
	The control system does not work properly.	- Incorrect control voltage. Check and correct. - Incorrect control signal. Check and correct. - Incorrect connection. Check and correct.

		- Incorrect humidity sensor. Check and correct. - Humidity controller not calibrated. Calibrate.
	Excessive external air volume.	- Reduce air volume.
Condensate forms in the ducts.	The humidifier is mounted very close to internal devices (e.g. gates or elbows) in the duct.	- Check fans, gates, etc. - Move the humidifier tubes to a point further from these devices upstream. - Add dispersion tubes to reduce absorption distance. Consult with FISAIR to determine the number of tubes required.
	An uninsulated duct passes through an unheated area (cold surface temperature).	- Insulate duct.
	The air cannot absorb the amount of steam discharged.	- The humidifier operates when the fan is off. Install flow switch. - The air temperature in the duct is very low for the amount of steam supplied.
	The steam pressure is very high, causing excess capacity.	- Reduce steam pressure.
	Foreign matter prevents the valve from opening.	- Clean or replace valve.

22 Spare Part List

SPARE PART	ITEM	COMPONENT	FISAIR CODE
1-FILTER IN Y 	1a	Threaded union. Stainless steel	
		1/2 "	62250205
		3/4 "	62250210
		1"	62250215
		1-1/4"	62250233
		1-1/2"	62250220
		2"	62250225
2-STEAM REGULATION VALVE (EMBRIDADA) 	2a	Flanged union. Stainless steel	
		DN15-Kvs:0,25	65610078
		DN15-Kvs:0,63	65610079
		DN15-Kvs:1,6	65610080
		DN15-Kvs:4	65610076
		DN20-Kvs:2,5	65610081
		DN20-Kvs:6	65610077
		DN25-Kvs:4	65610082
		DN25-Kvs:10	65610075
		DN32-Kvs:6,3	65610083
		DN32-Kvs:16	65610087
		DN40-Kvs:10	65610085
		DN40-Kvs:25	65610086
		DN50-Kvs:16	65610087
		DN50-Kvs:35	65610088
	2b	Flanged union. Carbon Steel casting	
		DN15-Kvs:0,16	65610097
		DN15-Kvs:0,2	65610098
		DN15-Kvs:0,32	65610099
		DN15-Kvs:0,4	65610101
		DN15-Kvs:0,5	65610100
		DN15-Kvs:0,63	65610150
		DN15-Kvs:0,8	65610105
		DN15-Kvs:1	65610104
		DN15-Kvs:1,25	65610102
		DN15-Kvs:1,6	65610107
		DN15-Kvs:2	65610151
		DN15-Kvs:2,5	65610108
		DN15-Kvs:3,2	65610106
		DN15-Kvs:4	65610103
		DN20-Kvs:6,3	65610109
		DN25-Kvs:4	65610113
		DN25-Kvs:5	65610114
		DN25-Kvs:6,3	65610110
		DN25-Kvs:8	65610115
		DN25-Kvs:10	65610117
		DN40-Kvs:12,5	65610118

SPARE PART	ITEM	COMPONENT	FISAIR CODE
2- STEAM REGULATION VALVE (THREADED) 	2c	Threaded union. Stainless steel	
		1/2 " -CV:0,1	65610005
		1/2 " -CV:0,22	65610010
		1/2 " -CV:0,4	65610015
		1/2 " -CV:0,75	65610020
		1/2 " -CV:1,3	65610025
		1/2 " -CV:2,2	65610030
		1/2 " -CV:3,25	65610035
		1/2 " -CV:3,6	65610040
		3/4"-CV:5	65610045
		3/4"-CV:6,2	65610050
	2d	Threaded union.-Bronze	
		1/2 " -CV:0,1	65600005
		1/2 " -CV:0,22	65600010
		1/2 " -CV:0,4	65600015
		1/2 " -CV:0,75	65600020
		1/2 " -CV:1,3	65600025
		1/2 " -CV:2,2	65600030
		1/2 " -CV:3,25	65600035
		1/2 "-CV:4,4	65600040
		3/4" -CV:5,5	65600045
		3/4" -CV:7,5	65600050
		1" -CV:10	65600051
		1" -CV:12	65600052
		1-1/4" -CV:20	65600065
		1-1/2" -CV:28	65600070
		2" -CV:40	65600075
3- ACTUATOR 	3a	Steam Valve Actuator 24AC/DC 50/60 Hz	
		MS51-7103-150 (0-10Vcc)	65620005
		MS51-7103-160 (4-20mA)	65620007
	3b	Steam Valve Actuator 0-10Vcc/24AC 1000N	65620015
	3c	Steam Valve Actuator 0-10Vcc/24AC 2800N	65620010
	3d	Steam Valve Actuator 0-10Vcc/24VAC 280N	65620107

SPARE PART	ITEM	COMPONENT	FISAIR CODE
4-STEAM TRAP 	4a	S&T Steam Trap 3/4" BSP 4,5Bar	65650025
	4b	S&T Steam Trap 3/4" BSP 4,5Bar Stainless	65650030
	4c	S&T Steam Trap 3/4 BSP 10 Bar	65650026
5-ESCUTCHEON PLATES 	5a	Stainless Steel AISI-304-2B	
		1/2" DN15 Ø60xØ24x1,5mm	40030130
		3/4" DN20 Ø60xØ29x1,5mm	40030131
		1" DN25 Ø80xØ36x1,5mm	40030132
		1-1/4" DN32 Ø90xØ44x1,5mm	40030133
		1-1/2" DN40 Ø112xØ51x1,5mm	40030134
		2" DN50 Ø132xØ62x1,5mm	40030135
6- O-RINGS	6a	O-RING Ø 40mm X 3,00mm VITON	62410020
7- NON-DRIP SAFETY THERMOSTAT 	7a	Non drip thermostat 30/120ºC	63410030
8- MAXIMUM HUMIDITY CUT-OFF HYGROSTAT 	8a	Ambient humidistat , 1 stage, 10A, 10-100 RH%,IP54	64220277
9- HUMIDISTAT WITH ENVIRONMENTAL/ROOM (RH) ACTIVE TRANSMITTER 	9a	Transmiter. Active H.R./humidistat ambient probe	64220107
10- HUMIDISTAT WITH ACTIVE DUCT TRANSMITTER (RH) 	10a	Transmiter. Active H.R./humidistat duct probe.	64220106

23 Declaration of conformity

23.1 Partly completed machinery (cuasi-machine)

DECLARACIÓN CE DE CONFORMIDAD
EC CONFORMITY DECLARATION
EG KONFORMITÄTSERKLÄRUNG
DECLARATION CE DE CONFORMITÉ

Departamento de Dirección de Calidad
Quality Management Department

Qualitätsmanagement-Abteilung
Département de gestion de la qualité

FISAIR S.L.U.
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28021 Madrid SPAIN
Tel.: (+34) 916921514
info@fisair.com

La presente declaración de conformidad se expide bajo exclusiva responsabilidad del fabricante.
This declaration of conformity is issued under the sole responsability of the manufacturer.
Diese konformitätserklärung wird in der alleinigen verantwortung des herstellers ausgestellt.
Cette déclaration de conformité est délivrée sous la seule responsabilité du fabricant.

Descripción/ Product description/ Produktbeschreibung/ Description du produit: **MT2 (P)**

Tipo de máquina/ Machine type/ Maschinetyp/ Type de machine: **CUASI MÁQUINA/ QUASI MACHINE/ QUASI MASCHINE/ QUASI MACHINE**

Marca/ Brand/ Marke/ Marque: **FISAIR**

Es conforme con la legislación de armonización pertinente a la unión europea:
It complies with the harmonization legislation relevant to the European Union:
Es entspricht den für die Europäische Union relevanten Harmonisierungsgesetzen
2006/42/CE
2014/30/UE
2014/35/UE

Es conforme con las siguientes normas:
It complies with the following standards:
Es entspricht den folgenden Normen:
Il est conforme aux normes suivantes:
UNE-EN ISO 12.100:2012
UNE-EN 60204-2:2019
UNE-EN 61000-6-6:2012
UNE-EN 61000-6-3:2012

FISAIR se exime de cualquier responsabilidad a menos que se cumplan con todas las instrucciones de instalación y funcionamiento proporcionadas por FISAIR, o si los productos han sido modificados o alterados sin el consentimiento por escrito de FISAIR, o si tales productos han sido sometidos a un mal uso, mala manipulación, alteración, mantenimiento inadecuado o muestran consecuencias de accidente o utilización negligente.
FISAIR disclaims any liability unless all installation and operating instructions provided by FISAIR are followed, or if products have been modified or altered without FISAIR's written consent, or if such products have been subjected to misuse. use, mishandling, alteration, improper maintenance or show consequences of accident or negligent use.

Lea el Manual de Instalación, Funcionamiento y Mantenimiento antes de utilizar este equipo.
La puesta en servicio de cuasi máquina estará prohibida hasta que la cuasi máquina sea montada en una máquina y esta cumpla las disposiciones de la Directiva 2006/42/CE y se disponga de la declaración de conformidad de acuerdo con lo dispuesto en el Anexo II A. En el manual se determinan medidas de seguridad que deberá cumplir la máquina en la que se monte la cuasi máquina. FISAIR no se responsabiliza de la seguridad.
Read the Installation, Use and Maintenance Manual before using this equipment.
The commissioning of the quasi-machine shall be prohibed until the quasi-machine is mounted on a machine and the machine complies with the provisions of Directive 2006/42/CE and the declaration of conformity is available in accordance with the provisions of Annex II A. The manual determines the safety measures that the machine on wich the quasi-machine is mounted must comply. FISAIR is not responsible for security.

Con exclusión de responsabilidades sobre las partes o componentes adicionados o montados por el cliente.
With no liability for the parts or components added or assembled by the customer.
Unter Ausschluß der Verantwortung über die vom Kunden bereitgestellten und/oder angebauten Teile.
Avec exclusion des responsabilités concernant les parties ou les composants ajoutés ou assemblés par le.

Juan Boeta Tejera
-Chairman and CEO- July 2020
Property of FISAIR

Rev01

23.2 Interchangeable equipment

DECLARACIÓN CE DE CONFORMIDAD
EC CONFORMITY DECLARATION
EG KONFORMITÄTSERKLÄRUNG
DECLARATION CE DE CONFORMITÉ

Departamento de Dirección de Calidad
Quality Management Department

Qualitätsmanagement-Abteilung
Département de gestion de la qualité

FISAIR S.L.U.
C/ Ciudad de Frias,33-(P.L. Camino de Getafe)
28021 Madrid SPAIN
Tel.: (+34) 916921514
info@fisair.com

La presente declaración de conformidad se expide bajo exclusiva responsabilidad del fabricante.
This declaration of conformity is issued under the sole responsability of the manufacturer.
Diese konformitätserklärung wird in der alleinigen verantwortung des herstellers ausgestellt.
Cette déclaration de conformité est délivrée sous la seule responsabilité du fabricant.

Descripción/ Product description/ Produktbeschreibung/ Description du produit: **MT2 (NP)**

Tipo de máquina/ Machine type/ Maschinetyp/ Type de machine: **EQUIPO INTERCAMBIABLE/ INTERCHANGEABLE EQUIPMENT/ AUSTAUSCHBARE AUSRÜSTUNG/ EQUIPEMENT INTERCHANGEABLE**

Marca/ Brand/ Marke/ Marque: **FISAIR**

Es conforme con la legislación de armonización pertinente a la unión europea:
It complies with the harmonization legislation relevant to the European Union:
Es entspricht den für die Europäische Union relevanten Harmonisierungsgesetzen
2006/42/CE
2014/30/UE
2014/35/UE

Es conforme con las siguientes normas:
It complies with the following standards:
Es entspricht den folgenden Normen:
Il est conforme aux normes suivantes:
UNE-EN ISO 12.100:2012
UNE-EN 60204-2:2019
UNE-EN 61000-6-6:2012
UNE-EN 61000-6-3:2012

FISAIR se exime de cualquier responsabilidad a menos que se cumplan con todas las instrucciones de instalación y funcionamiento proporcionadas por FISAIR, o si los productos han sido modificados o alterados sin el consentimiento por escrito de FISAIR, o si tales productos han sido sometidos a un mal uso, mala manipulación, alteración, mantenimiento inadecuado o muestran consecuencias de accidente o utilización negligente.
FISAIR disclaims any liability unless all installation and operating instructions provided by FISAIR are followed, or if products have been modified or altered without FISAIR's written consent, or if such products have been subjected to misuse. use, mishandling, alteration, improper maintenance or show consequences of accident or negligent use.

Lea el Manual de Instalación, Funcionamiento y Mantenimiento antes de utilizar este equipo.
La puesta en servicio de cuasi máquina estará prohibida hasta que la cuasi máquina sea montada en una máquina y esta cumpla las disposiciones de la Directiva 2006/42/CE y se disponga de la declaración de conformidad de acuerdo con lo dispuesto en el Anexo II A. En el manual se determinan medidas de seguridad que deberá cumplir la máquina en la que se monte la cuasi máquina. FISAIR no se responsabiliza de la seguridad.
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Avec exclusion des responsabilités concernant les parties ou les composants ajoutés ou assemblés par le.

Juan Boeta Tejera
-Chairman and CEO- July 2020
Property of FISAIR

Rev01

24 Warranty

FISAIR S.L.U. WARRANTY POLICY

Quality Department
Departamento de Calidad

FISAIR S.L.U.
C/ Uranio, 20 (Pol. Ind. Aimayr)
28330 San Martín de la Vega (Madrid) SPAIN
Tfº (34) 916921514
Fax (34) 916916456

Two-year Limited Warranty

FISAIR warrants to the original purchaser that its products will be free from defects in materials and parts for a period of two (2) years after installation or twenty-seven (27) months from the date FISAIR ships such product, whichever date is the earlier.

If any FISAIR product is found to be defective in material or assembly during the applicable warranty period, FISAIR's entire liability, and the purchaser's sole and exclusive remedy, shall be the repair or replacement of the defective product or part.

Warranty disclaimer

FISAIR shall not be liable for any costs or expenses, whether direct or indirect, associated with the installation, removal or reinstallation of any defective product.

The Limited Warranty does not include any consumer part such as joints, pulleys, filters or media.

FISAIR's Limited Warranty shall not be effective or actionable if:

a) All related product invoices have been payed in time and terms.
b) Unless there is compliance with all installation and operating instructions furnished by FISAIR, or if the products have been modified or altered without the written consent of FISAIR, or if such products have been subject to accident, misuse, mishandling, tampering, negligence or improper maintenance. Such situations could be an incorrect power supply connection, crashed with inappropriate objects, security protection devices unblocked and so.
c) Components and/or manufactures are affected or damaged by the effects of corrosion (gradual wear of the metal bodies by the action of external actors not controlled by FISAIR).

Any warranty claim must be submitted to FISAIR in writing within the stated warranty period.

Parts Warranty

Defective parts may be required to be returned to FISAIR. In case any part is claimed as a faulty one, FISAIR will ask the customer to send the part back to the factory in order to analyze if the part is failing due to any of above referred actions (see warranty disclaimer) or due to effective part failing.

If the part must be replaced immediately, FISAIR will ship the part to the customer immediately and invoice the part with a 30 days delay payment for the faulty part to be returned. If the part is returned in this period, the part fail analysis would be made to emit a technical report for the warranty coverage based in this Warranty Statement document.

In case that the part is failing due to a lack of quality, FISAIR will credit this invoice in order to stop the payment. In case FISAIR does not receive the part in this period, or if the failure is due to the reasons covered in the Warranty disclaimer paragraph, the invoice will be effective.

In case any part from the product / shipment is missing, the customer should notify FISAIR before 3 days from the shipment date of arrival.

FISAIR S.L.U. WARRANTY POLICY

Quality Department
Departamento de Calidad

Service Covered by Warranty

In case that there is any FISAIR product that should be serviced in order to recover its proper used designed, FISAIR will select the person (s) in charge of this operation. These qualified technicians should have the enough knowledge to service FISAIR units.

No company should practice a warranty service without the writing FISAIR notice giving the authorization to do it and if any cost should be cover by FISAIR should be advised in advance to the service job. In case that FISAIR should send FISAIR staff to solve the solution, trip expenses are not covered by the warranty.

FISAIR's Limited Warranty is made in lieu of, and FISAIR disclaims all other warranties, whether express or implied, including but not limited to any implied warranty of merchantability, any implied warranty of fitness for a particular purpose, any implied warranty arising out of a course of dealing or of performance, custom or usage of trade.

FISAIR shall not, under any circumstances be liable for any direct, indirect, incidental, special or consequential damages (including, but not limited to, loss of profits, revenue or business) or damage or injury to persons or property in any way related to the manufacture or the use of its products. The exclusion applies regardless of whether such damages are sought based on breach of warranty, breach of contract, negligence, strict liability in tort, or any other legal theory, even if FISAIR has notice of the possibility of such damages.

By purchasing FISAIR's products, the purchaser agrees to the terms and conditions of this Limited Warranty.

Extended Warranty

The original user may extend the term of the FISAIR Limited Warranty for a limited number of months past the initial applicable warranty period and term provided in the first paragraph of this Limited Warranty. All the terms and conditions of the Limited Warranty during the initial applicable warranty period and term shall apply during any extended term.

Each case should be valued in terms of type of product, equipment application, use and location of the product operation site.

Any extension of the Limited Warranty under this program must be in writing, signed by FISAIR, and paid for in full by the purchaser.

Quality Manager:

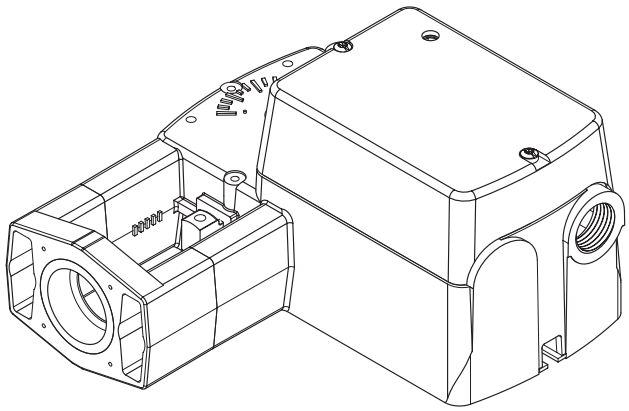
Hugo J. López Álvarez
San Martín de la Vega, February 2016

MA51-710x Two Position Series
MF51-7103 Floating Series
MS51-7103 Proportional Series

SmartX Actuators
Linear Spring Return
General Instructions

Application

Linear SmartX Actuators are designed to mount directly onto two-way or three-way globe valves without the use of linkages. They provide linear travel to operate valves from 1/2” to 2” VB-7xxx and discontinued 1/2” to 1-1/4” VB-9xxx in chilled water, hot water and steam applications up to 366 °F (186 °C). Linear spring return actuators provide either two position, floating or proportional modulation control (depending on model selection) of valves in HVAC systems.



Mx51-710x

Features

- Two position models controlled by SPST controller
- Floating models controlled by SPDT floating controllers
- Proportional models controlled by 0-3 Vdc, 6-9 Vdc, 0-10 Vdc, 0-20 mAdc, 2-10 Vdc, or 4-20 mAdc. Control function direct/reverse action is jumper selectable
- 105 lb force (467 newton) with 1/2” (13 mm) nominal linear stroke
- 24 Vac, 120 Vac, and 230 Vac models
- Rugged polymer housings rated for up to NEMA 2/ IP54
- Overload protection throughout stroke
- Automatically sets input span to match valve travel
- Compact size to allow installation in limited space
- Manual override to allow positioning of valve and preload
- Spring return operation
- Direct mount to valves without separate linkage
- Polymer housing rated for plenum use
- Five year warranty

Applicable Literature

F-Number	Description	Audience	Purpose
F-26080	EN-205 Water System Guidelines	– Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes Schneider Electric approved water treatment practices.
F-27252	Vx-7xxx-8xx Series Vx-7xxx-59x Series Vx-9xxx-8xx Series Vx-9xxx-59x Series Selection Guide	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides Mxx1-720x and Mx51-710x actuator, valve, and valve assembly selection data including specifications, close-off pressures, and dimensional information.
F-26895	AM-703 Input Scaling Module, AM-704 Pulse Width Modulation Interface, AM-705 Positioner, AM-706 Positioner, AM-708 Resistor	– Installers – Service Personnel – Start-up Technicians	Provides step-by-step mounting instructions
F-27175	AM-756 Metric Conduit Adapter, AM-763 Hexcrank, AM-770 Replacement Valve Linkage Parts Kit		Provides step-by-step mounting instructions
F-27382	TAC Electric/Electronic Products Catalog	– Sales Personnel – Application Engineers	Comprehensive catalog containing TAC's electric/electronic actuators, thermostats, controllers, sensors, transmitters, and accessories

SPECIFICATIONS

Actuator Inputs

Control Signal: See Table-1 for actuator models and control type.
Power Input: See Table-1. All 24 Vac circuits are Class 2. All circuits 30 VAC and above are Class 1.
Connections: 3 ft (91 cm) appliance wire or plenum cables, enclosure accepts 1/2" (13 mm) conduit connectors. For M20 Metric connector, use AM-756 adaptor.

Actuator Outputs

Electrical:

Position Feedback Voltage (proportional or floating only)

For voltage ranges, the feedback signal is the same range as the input signal. The 4-20 mAdc current range and floating actuators have a 2-10 Vdc position feedback signal. The position feedback signal can supply up to 0.5 mAdc to operate up to four additional slave actuators.

Mechanical:

Linear Stroke, 1/2" (13 mm) nominal.
Approx. Stroke Timing, See Table-1.
Manual Override, Allows positioning of valve and preload using manual crank.
Right/Left Jumper, Permits reverse acting/direct acting linear motion (MS51 only).

Environment:

Ambient Temperature Limits
Shipping & Storage, -40 to 160 °F (-40 to 71 °C).
Operating, -22 to 140 °F (-30 to 60 °C).
Temperature Restrictions, For maximum ambient 140 °F (60 °C) the maximum allowable fluid temperature should not exceed valve rating. See F-27252 Selection Guide for specific ratings.

Humidity: 5 to 95% RH, non-condensing.

Location:

NEMA 1. NEMA 2 (enclosure is air plenum rated), UL Type 2 (IEC IP54) with customer supplied water tight conduit connectors.

Agency Listings

UL 873: Underwriters Laboratories (File #E9429 Category Temperature-Indicating and Regulating Equipment).
CUL: UL Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24-93.
European Community: EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC).
Australia: This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radio Communications Act 1992.

Note: All performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult Schneider Electric. Schneider Electric shall not be liable for damages resulting from misapplication or misuse of its products.

Table-1 Specifications.

Part Number	Control Signal	Actuator Power Input						Approximate Stroke Timing in Seconds @ 70F (21°C)	
		Voltage	Wiring System	Running			Holding		
				50/60 Hz		DC Amps	50/60 Hz	Powered	Spring Return
				VA	W		W		
MA51-7103-000	Two Position SPST	24Vac ±20% 20-30 Vdc	Appliance Wire	5.3	4.1	0.15	1.2	44	19
MA51-7103-100			Plenum Cable	5.3	4.1	0.15	1.2		
MA51-7100-000		120 Vac ±10% 50/60 Hz	Appliance Wire	7.9	6.2	n/a	2.1		
MA51-7101-000		230 Vac ±10% 50/60 Hz	Appliance Wire	7.4	5.4	n/a	2.1		
MF51-7103-000	Floating	24Vac ±20% 20-30 Vdc	Appliance Wire	6.9	4.7	0.16	2.1	60	16
MF51-7103-100			Plenum Cable	6.9	4.7	0.16	2.1		
MS51-7103-000	2-10 Vdc Proportional		Appliance Wire	6.6	4.2	0.14	1.5		
MS51-7103-100[b]			Plenum Cable	6.6	4.2	0.14	1.5		
MS51-7103-020[b]	0-3 Vdc Proportional		Appliance Wire	6.6	4.2	0.14	1.5		
MS51-7103-120[b]			Plenum Cable	6.6	4.2	0.14	1.5		
MS51-7103-030[b]	6-9 Vdc Proportional		Appliance Wire	6.6	4.2	0.14	1.5		
MS51-7103-130[b]			Plenum Cable	6.6	4.2	0.14	1.5		
MS51-7103-040[b]			Appliance Wire	7.8	4.9	0.16	3.4		
MS51-7103-140[b] [d]			Plenum Cable	7.8	4.9	0.16	3.4		
MS51-7103-050[b]	0-10 Vdc Proportional		Appliance Wire	6.6	4.2	0.14	1.5		
MS51-7103-150[b]			Plenum Cable	6.6	4.2	0.14	1.5		
MS51-7103-060[b]	4-20 mAdc		Appliance Wire	6.6	4.2	0.14	1.5		
MS51-7103-160[b]			Plenum Cable	6.6	4.2	0.14	1.5		

[a]Timing was measured with the actuator mounted on a VB-7xxx Series valve.

[b]Proportional (MS) models shipped with RA/DA jumper set for DA (actuator extends with increasing signal).

[c]4-20 mAdc with AM-708 500 ohm field-installed resistor.

[d]Has 20 Vdc power supply for System 8000 applications.

Globe Valve Close-Off Pressures:13 For close-off pressure ratings on globe valve assemblies, consult Linked Globe Valve Assemblies with SmartX Linear Series Actuators Selection Guide F-27252.x13

ACCESSORIES

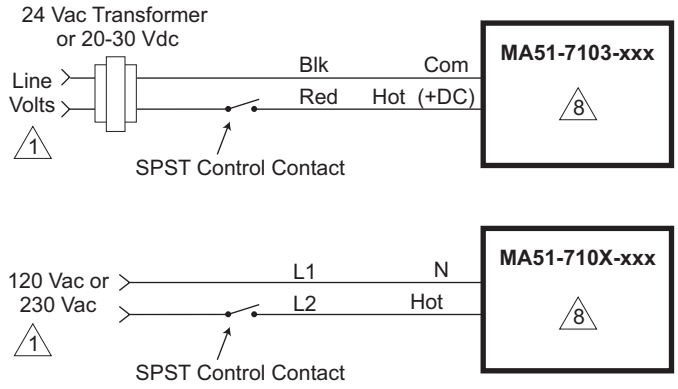
AM-756	Metric Conduit Adapter M20 x 1.5 to 1/2" NPT
AM-770	Replacement valve linkage parts kit
AM-764	Linkage kit for damper applications

MS51-7103

AM-703	Input rescaling module, adjust signals to 2-10 Vac, zero and span adjust
AM-704	Interface, pulse width modulation (PWM)
AM-705	Positioner (NEMA 4 housing)
AM-706	Min and/or manual positioner for flush panel mount
AM-708	500 ohm resistor for 4 to 20 mA control signal

TYPICAL TWO POSITION CONTROL (wiring diagrams)

Figure-1 illustrates typical wiring diagrams for spring return **two-position MA51-710x** actuators. See Table-1 for model selection. See 8 for wiring diagrams notes guide.



Voltage	L1 N	L2 Hot
120 Vac	White	Black
230 Vac	Blue	Brown

Figure-1 Typical Wiring Diagrams for Two Position Actuators

TYPICAL FLOATING CONTROL (wiring diagrams)

Figure-2 through Figure-5 illustrates typical wiring diagrams for spring return **floating MF51-7103** actuators. See Table-1 for model selection. See 8 for wiring diagrams notes guide.

Caution: This product contains a half-wave rectifier power supply and must not be powered off transformers used to power other devices utilizing non-isolated full-wave rectifier power supplies. Refer to EN-206, Guidelines for Power Multiple Devices from a Common Transformer, F-26363 for detailed information.

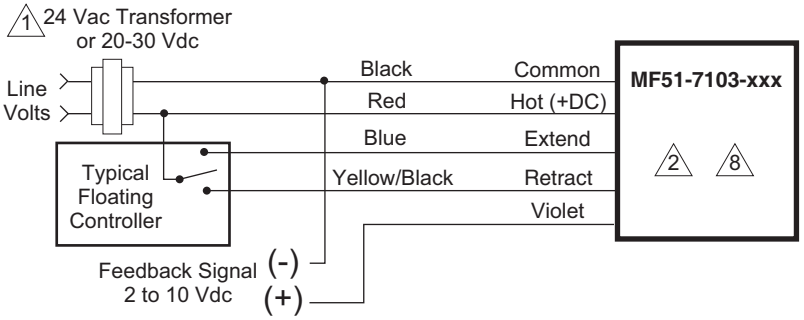


Figure-2 Floating Point Control

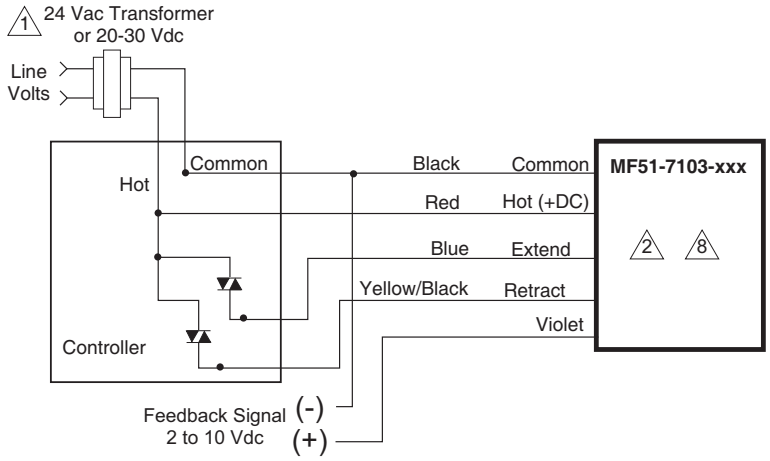


Figure-3 Triac Source

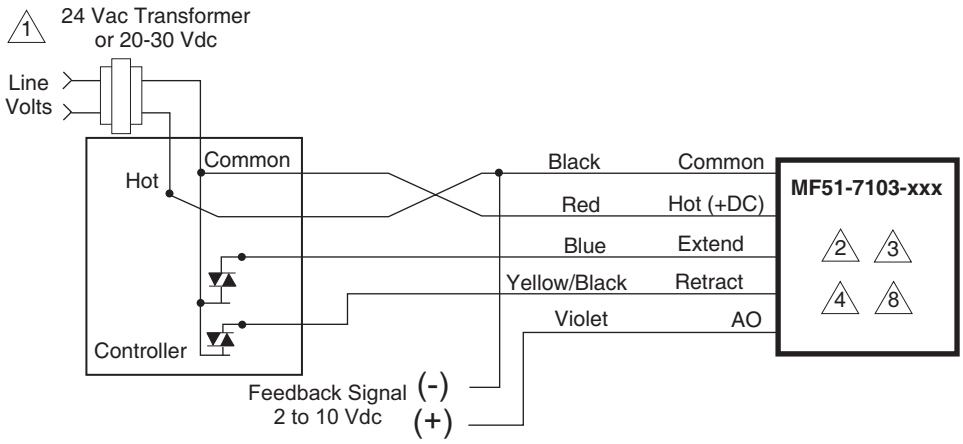


Figure-4 Triac Sink

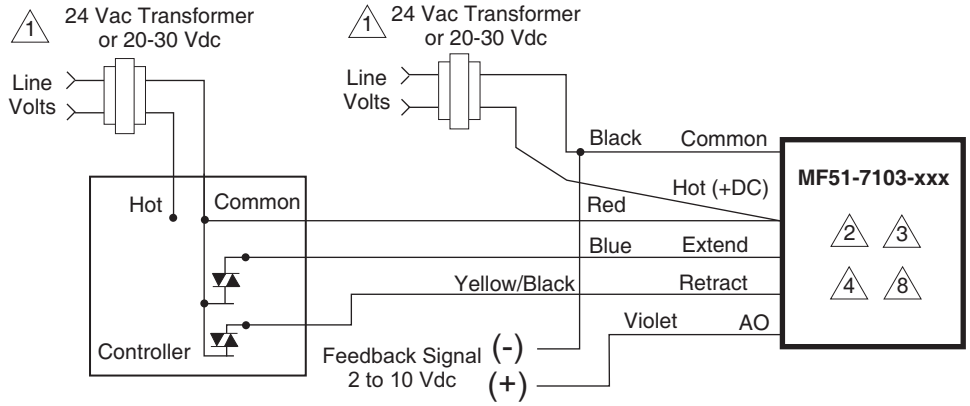


Figure-5 Triac Sink With Separate Transformers

TYPICAL PROPORTIONAL CONTROL (wiring diagrams)

Figure-6 illustrates typical wiring diagrams for spring return **proportional MS51-7103** actuators. See Table-1 for model selection. See 8 for wiring diagrams notes guide.

Caution: This product contains a half-wave rectifier power supply and must not be powered off transformers used to power other devices utilizing non-isolated full-wave rectifier power supplies. Refer to EN-206, Guidelines for Powering Multiple Devices from a Common Transformer, F-26363 for detailed information.

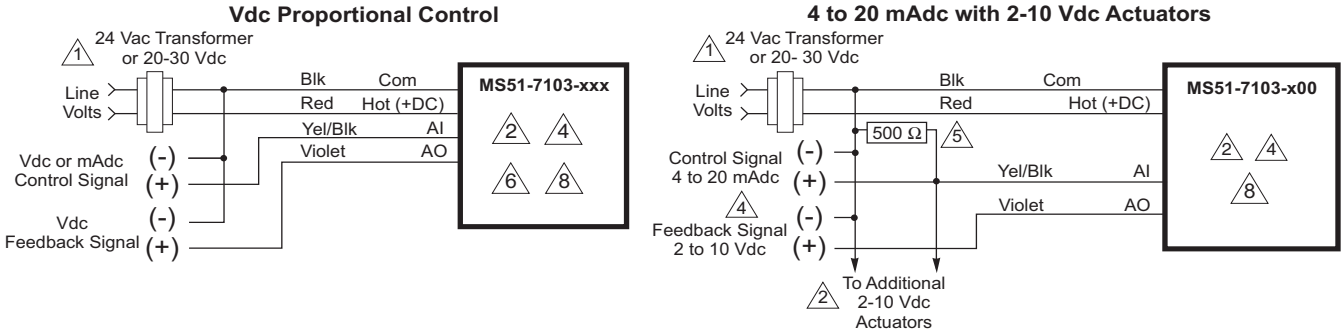


Figure-6 Typical Wiring Diagrams for Proportional Control 24 Vac Basic Models

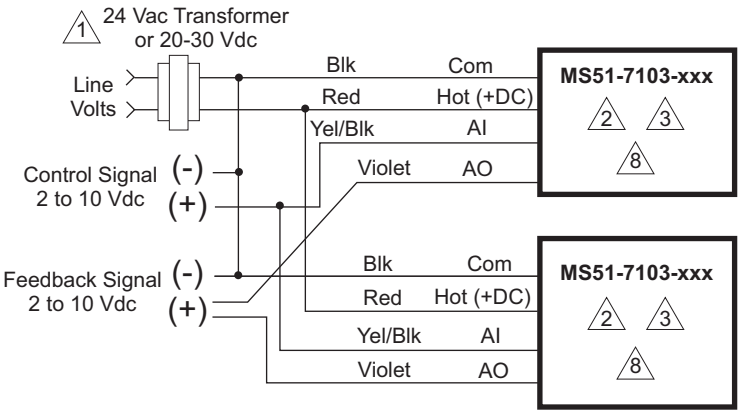


Figure-7a Typical Wiring Diagrams for Proportional Control 24 Vac Models Wired in Parallel

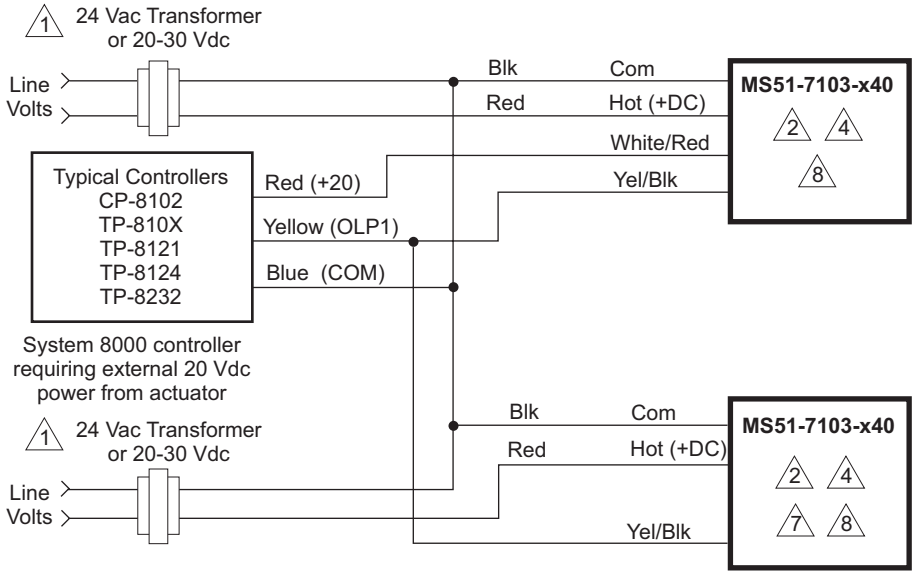


Figure-7b Typical Control Wiring for Two MS51-7103-x40 to System 8000 Controllers Requiring External 20 Vdc Power from Actuator

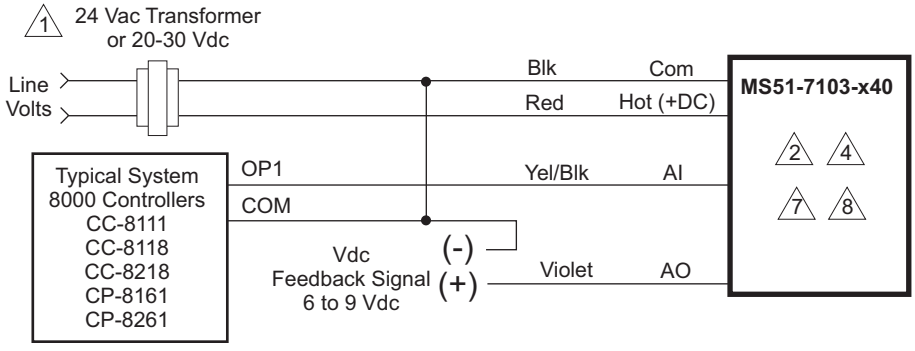


Figure-7c Typical Control Wiring for MS51-7103-x40 to Controllers not Requiring External 20 Vdc Power from Actuator

1. Provide overload protection and disconnect as required.
2. Actuators may be wired (120V mA does not have red wire and 230V mA does not have red or black wires) in parallel. All actuator black wires are connected to the transformer common and all red wires are connected to the hot lead. Power consumption must be observed.
3. The Common connection from the actuator must be connected to the Hot connection of the controller. The actuator Hot must be connected to the controller Common.
4. If the controller uses a full-wave power supply and does not provide isolated outputs, a separate transformer is required.
5. A field-supplied 500 ohm resistor (AM-708) is required for this application.
6. On MS51-7103-X60 (4-20 mAdc) models a 500 ohm resister is incorporated in the product. Do not use an external resistor.
7. If using multiple MS51-7103-040's with TAC System 8000 controller requiring 20 Vdc power; tape off red +20 Vdc power supply leads on all but one actuator.
8. Cable on some models contains more wires than are used in applications. Only those wires actually used are shown.

Figure-8 Wire Diagram Notes Guide

INSTALLATION

Inspection

Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

Requirements

- Job wiring diagrams
- Appropriate accessories
- Pliers for removing and inserting connecting pin
- Installer must be a qualified, experienced technician
- TOOL-37, 1 5/8” open end wrench for valve mounting nut
- 5/16” and 7/16” open-end wrench for stem jam nuts and stem extension
- #8 Torx screwdriver (not provided)

Precautions

General

Warning:

- Electrical shock hazard! Disconnect the power supply (line power) before installation to prevent electric shock and equipment damage.
- Make all connections in accordance with the job wiring diagram and in accordance with national and local electrical codes. Use copper conductors only.
- Floating and Proportional Models: These products contain a half-wave rectifier power supply. They must not be powered with transformers that are used to power other devices utilizing non-isolated full-wave rectifier power supplies. Refer to EN-206, Guidelines For Powering Devices From A Common Transformer, F-26363 for detailed information.

Caution:

- Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.
- Manual override to be used only when power is not applied to unit.
- When operating manual override (observe position indicator), back off 5° from full extended mechanical stop to ensure proper release.
- Use with fluid temperatures above 100°C requires insulation on the pipe and control valve.

Federal Communications Commission (FCC)

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This

equipment generates, uses, and can radiate radio frequency energy and may cause harmful interference if not installed and used in accordance with the instructions. Even when instructions are followed, there is no guarantee that interference will not occur in a particular setting—Which can be determined by turning the equipment off and on—the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Canadian Department of Communications (DOC)

Note: This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte toutes les exigences du Reglement sur le material broilleur du Canada.

European Standard EN 55022

Warning: This is a Class B digital (European Classification) product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Location

Caution: Avoid locations where excessive moisture, corrosive fumes, vibration, or explosive vapors are present.

Mounting

- Mount the linear actuator directly on the valve in locations that clear the maximum dimensions of the actuator case (see Figure-12).
- Ensure that the valve body is installed correctly. The arrow must point in the direction of flow. With three-way valves observe stem position (stem up or stem down) for proper flow characteristics. See Table 3.
- It is preferable that the actuator is mounted above the valve body. This will minimize the risk of damage to the actuator in the event of condensation or a valve leak. Refer to Figure-10.

Changing Control Function (proportional units only)

These actuators are equipped with a jumper to control the function of the signal as received. See Figure-9. Factory setting is for direct acting. Remove cover to change jumper setting.

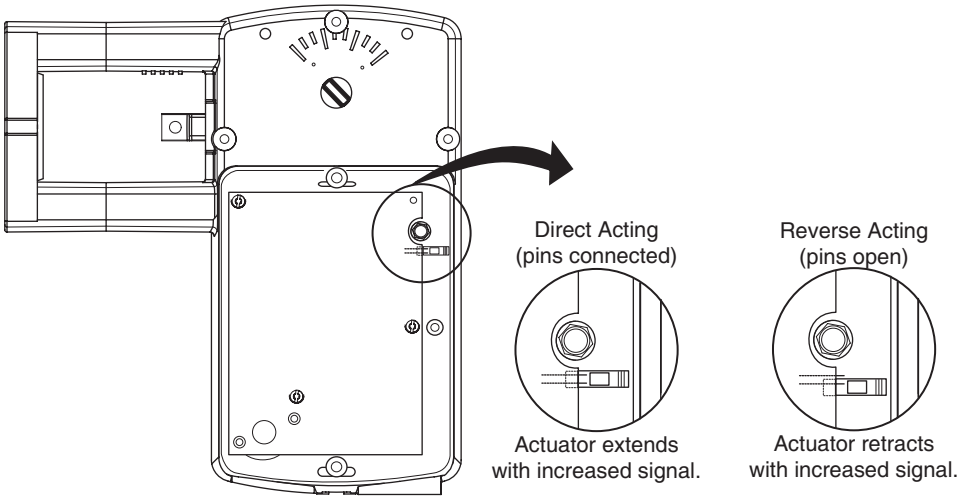


Figure-9 RA/DA Jumper Setting for Proportional Models

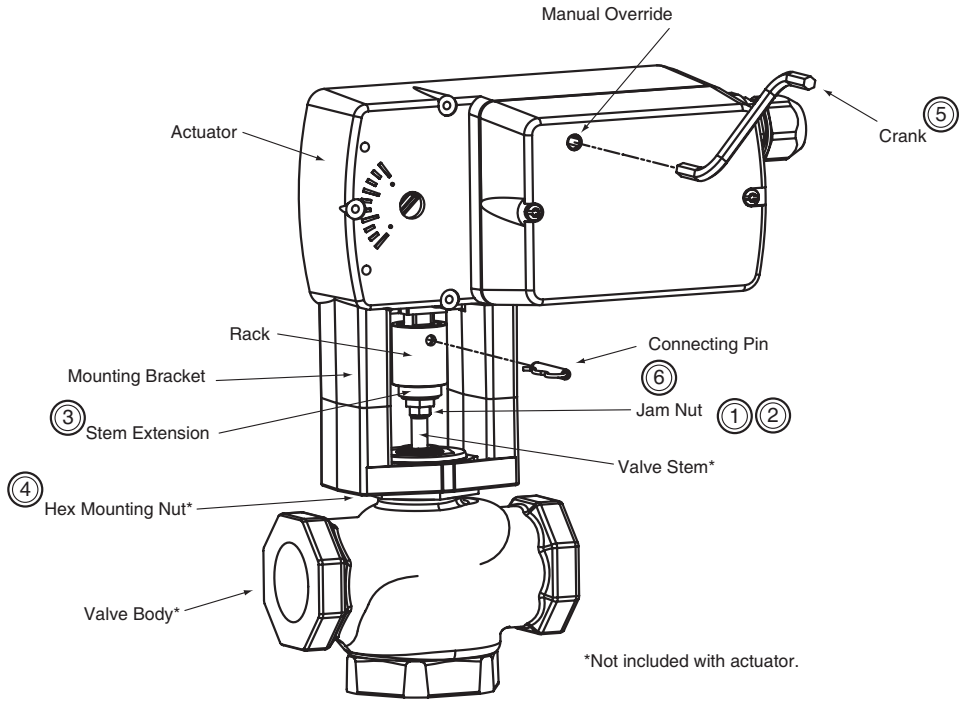


Figure-10 Mx51-710x Series Actuator Exploded View

Installation: Mx51-710x Series Actuator to 1/2" to 2" VB-7xxx Series Valve Bodies, 2-Way Stem-Up Closed and 3-Way Mixing or Diverting Applications

A. Preload the valve to insure proper close-off according to the numbered steps in Figure-10 and the text below. (Remove power before proceeding.)

1. Locate the steel jam nut that came packaged with the actuator. (Do not re-use the brass jam nut present on an existing valve.)
2. Screw the nut onto the valve stem all the way as far as it will go (you may need to use a TOOL-20-1 or a 5/16" open-end wrench). At least 1/2" of the valve stem should extend above the nut.
3. Thread the stem extension onto the valve stem, making contact with the jam nut. Raise the valve stem to the full up position.

4. Orient the actuator mounting bracket on the valve and tighten the hex mounting nut securely against the bracket using TOOL-37.
5. Insert the crank provided in the actuator cover. Wind two turns counterclockwise. Press in the turn crank 1/8 turn counterclockwise to lock in position.
6. Rotate the stem extension until the through holes in the stem extension and rack line up. Insert connecting pin to secure stem extension and tighten jam nut against stem extension using TOOL-20-1 or a 5I16" open end wrench.

B. Apply power to the actuator and check the system operation for heating or cooling output in response to the control signal.

Installation: Mx51-710x Series Actuator to 1/2" to 2" VB-7xxx Series Valve Bodies, 2-Way Stem-Up Open

A. Preload the valve to insure proper close-off according to the numbered steps to 10 and the text below. (Remove power before proceeding.)

1. Locate the steel jam nut that came packaged with the actuator. (Do not re-use the brass jam nut present on an existing valve.)
2. Screw the nut onto the valve stem as far as possible (use TOOL-20-1 or a 5/16"open-end wrench if needed). At least 1/2" of the valve stem should extend above the nut.
3. Thread the stem extension onto the valve stem, making contact with the jam nut. Push the valve stem to the full down position.
4. Orient the actuator mounting bracket on the valve and tighten the hex mounting nut securely against the bracket using TOOL-37.
5. Insert the crank provided in the actuator cover. Wind the crank counterclockwise until the actuator fully extends, then unwind 2 turns and press in and turn crank 1/8 turn counterclockwise to lock in position.
6. Rotate the stem extension until the through holes in the stem extension and rack lineup. Insert connecting pin to secure stem extension and tighten jam nut against stem extension using TOOL-20-1 or a 5I16" open end wrench.

B. Apply power to the actuator and check the system operation for heating or cooling output in response to the control signal.

Valve Mounting

The valve should be mounted in a weather-protected area, in a location that is within the ambient temperature limits of the actuator. The installation of the actuator assembly should provide clearance on all sides to allow for any maintenance that may be needed (see Figure-10 and Figure-11).

1. Following general piping practices is recommended.
2. Apply pipe sealant sparingly to all but the last two threads of a properly threaded, reamed, and cleaned pipe. Make sure the pipe chips, scale, etc. do not get into the pipe since this material may lodge in the valve seat and prevent proper closing and opening of the valve. The valve must be piped with an inlet and an outlet.
3. Start the joint hand-threading the pipe into the valve. If the thread alignment feels normal, continue to turn the pipe by hand as far as it will go.
4. Use a pipe wrench to fully tighten the pipe to the valve.

Caution: Do not over-tighten the pipe, which may cause stripped threads. Avoid twisting or crushing the valve while tightening the pipe.

---

5. Insulate only the valve body and associated piping, not the actuator.
6. In chilled or cold water systems where the environment is humid, use a drip pan under the valve to catch condensate.

Caution: The SmartX linear actuator is designed to effectively support its own weight. No load or weight should be resting on the actuator, long term damage may occur to the actuator, mounting connection or the valve.

- Do not insulate the actuator/linkage. Doing so will result in excess heat buildup within the actuator.

- For non-steam application the globe valve assembly must be mounted so that the actuator is at least 5° above the horizontal (Figure-11) to ensure that any condensate that forms will not travel into the mounting bracket or actuator.
- On steam applications, the globe valve assembly must be mounted approximately 45° from horizontal.
- Temperature Restrictions: For maximum ambient 140 °F (60 °C) the maximum allowable fluid temperature should not exceed valve rating. See F-27252 Selection Guide for specific ratings.

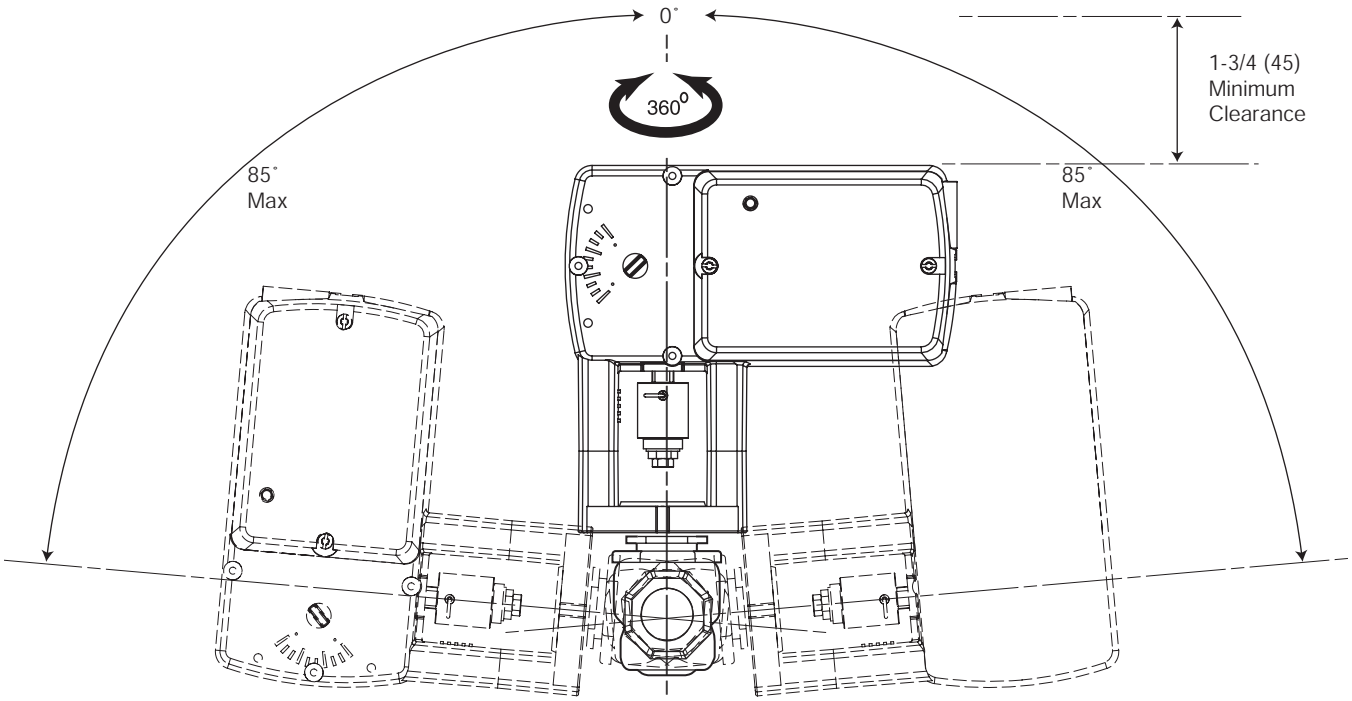


Figure-11 Acceptable Mounting Orientations for Non-Steam Applications

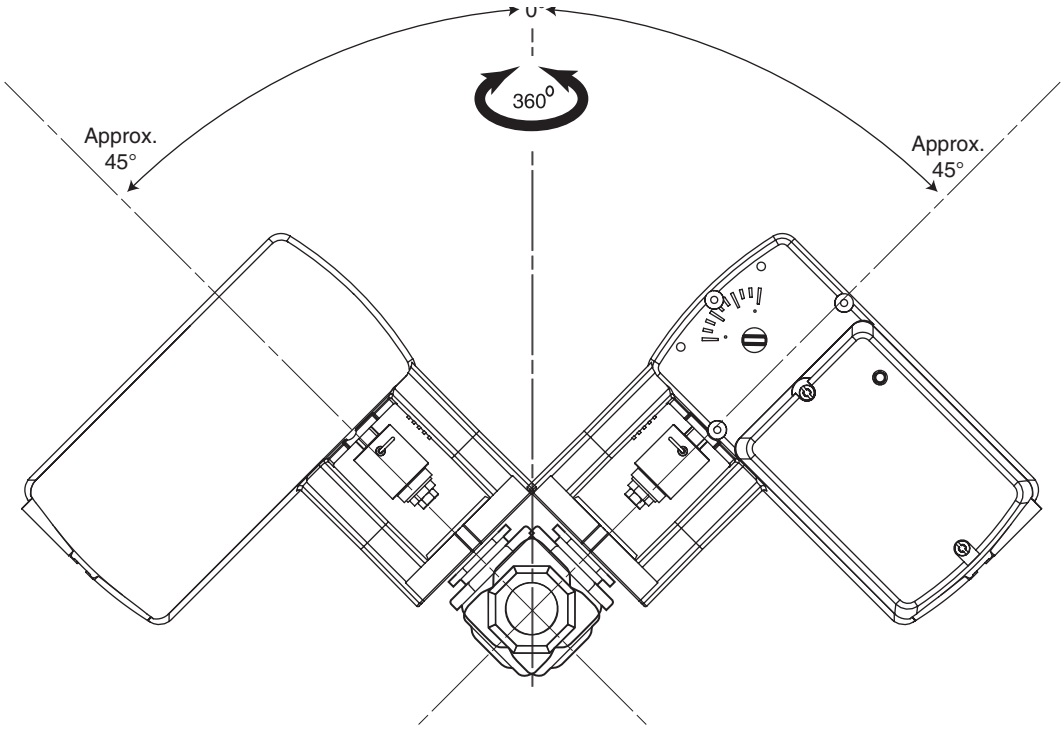


Figure-12 Acceptable Mounting Orientation for Steam Applications

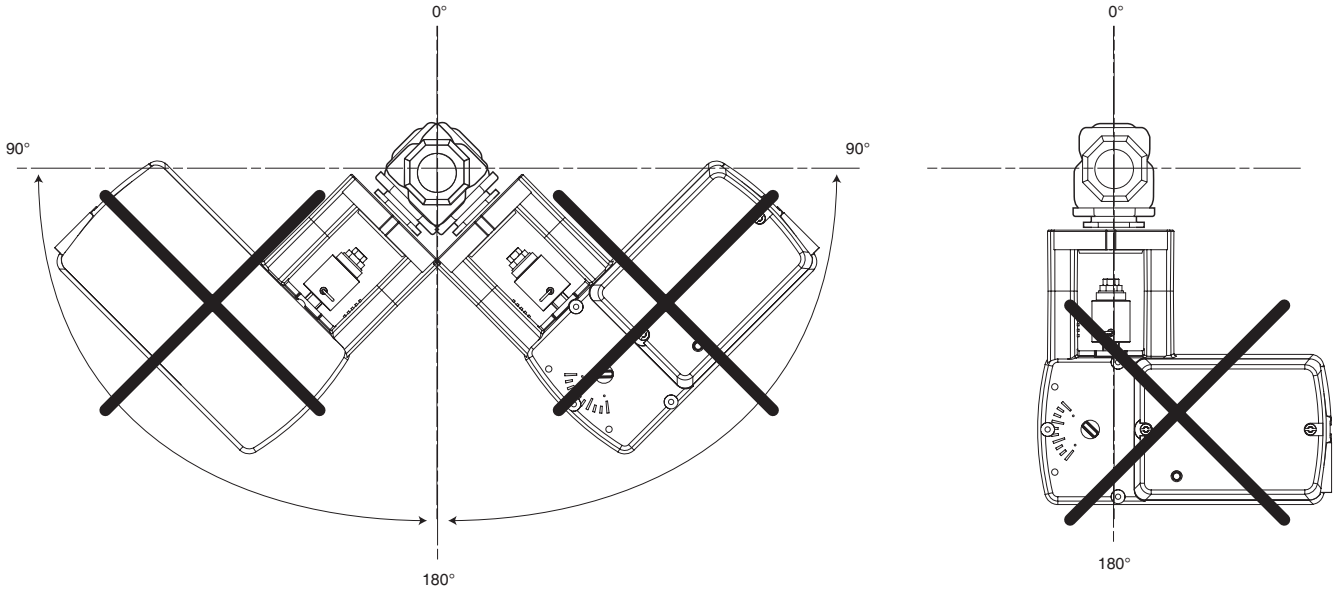


Figure-1 Unacceptable Mounting Orientation

MANUAL OVERRIDE OPERATION

When necessary, the actuator's output shaft can be repositioned using the manual override mechanism as follows:

1. Disconnect power from the actuator. The actuator will fully retract.
2. Without pushing down on the crank, crank the manual override counterclockwise until the actuator extends to the desired position. Push in until the mechanism locks in position. (The manual override lock will release the next time power is applied.)
3. If you desire to reposition the actuator manually from a locked position, turn the crank 1/8 turn counterclockwise and pull out to release. Adjust position as desired.

Caution:

- Only use manual override when the actuator drive motor is not powered.
- Engaging the manual override when the actuator is powered may cause damage to the gears.
- Using power tools to adjust the override will cause damage to the gears.

Wiring Requirements

Control Leads

See Table-2 for power wiring data. Refer to Figure-1 through Figure-7 for typical wiring.

Table-2 Power Wiring

Actuator Voltage	Part Number	Maximum Wire Run in ft. (m)					
		12 AWG	14 AWG	16 AWG	18 AWG	20 AWG	22 AWG
24 Vac 20-30 Vdc	MA51-7103	1678 (512)	1055 (322)	664 (202)	417 (127)	263 (80)	208 (63)
	MF51-7103	1289 (393)	810 (247)	510 (155)	321 (98)	202 (61)	160 (49)
	MS51-7103	1140 (348)	717 (219)	451 (137)	284 (86)	178 (54)	141 (43)

CHECKOUT

After the entire system has been installed and the actuator has been powered up, the following check can be made for proper system operation. Check for correct operation of the valve while actuator is being stroked.

1. Apply power to the actuator. Actuator and valve should be driven to their powered position as determined by the control signal. Refer to Table-3 for valve flow.

2. Break power to the actuator. Actuator and valve should return to the spring return position (retracted position).

Table-3 Assembly Configuration Chart

Valve Body	Valve Body Action	Normal Position		Action[a]
		Valve Stem	Flow	
VB-721x VB-921x	Two-Way Stem Up Open	Up	Open	A to AB flow decreases as actuator extends
VB-722x VB-922x[b]	Two-Way Stem Up Closed	Up	Closed	A to AB flow increases as actuator extends
VB-731x VB-931x[b]	Three-Way Mixing	Up	B to AB	A to AB flow increases as actuator extends B to AB flow decreases as actuator extends
VB-732x VB-932x[b]	Three-Way Diverting	Up	B to AB	B to A flow increases as actuator extends B to AB flow decreases as actuator extends

[a]Proportional models shipped with RA/DA jumper set for DA (actuator extends with increasing signal).

[b]Discontinued 1/2" to 1-1/4" VB-9xxx.

Note: Check that the transformer(s) are sized properly.

- If a common transformer is used with multiple actuators, make sure that polarity is observed on the secondary. This means connecting all black wires to one leg of the transformer and all red wires to the other leg of the transformer.
- If multiple transformers are used with one control signal, make sure all black wires are tied together and tied to control signal negative (-).
- If the controller uses a full-wave power supply and does not provide isolated outputs, a separate transformer is required.

THEORY OF OPERATION

The MA, MF and MS series actuators are directly mounted onto the valve without the use of a separate linkage. They are equipped with true mechanical spring return operation for reliable, positive close-off on valves. When power is applied, the actuator moves to its powered position, at the same time tensing the spring return safety mechanism. When the power is removed, the spring returns the actuator to its normal position (retracted position). The spring return system provides consistent close-off force to the valve.

MA series two-position actuators use a DC motor controlled by on board electronics. When the actuator encounters a stall or end of travel position, the motor current is automatically reduced, preventing damage to the actuator or motor.

MF or MS series floating or proportional actuators use a DC motor which is controlled by a microprocessor. The microprocessor supplies the intelligence to provide a constant speed and to know the actuator's exact position. The microprocessor monitors and controls the DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition.

All actuators may be stalled anywhere in their normal rotation without the need of a mechanical end switch.

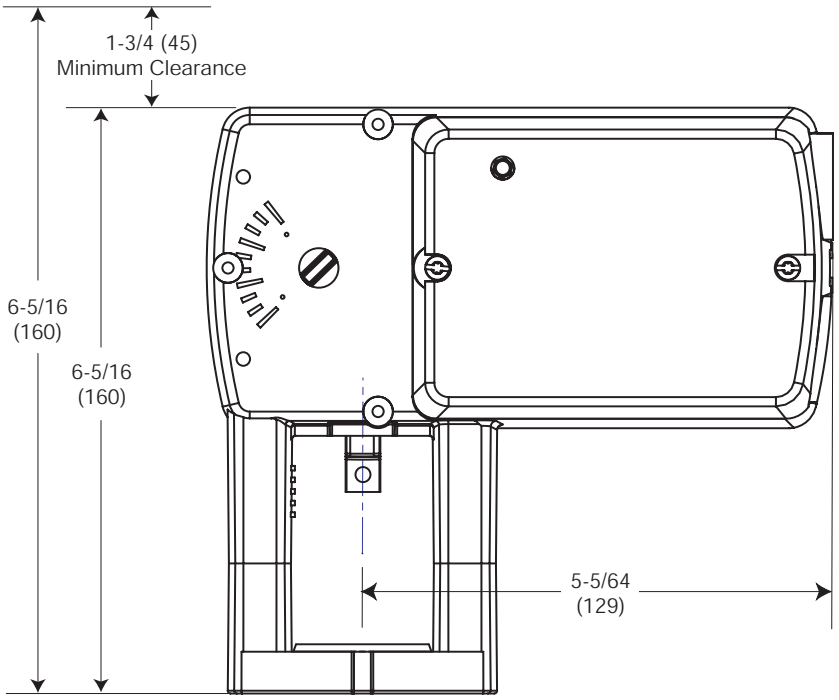
MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained optimum performance. The Linear series actuators are maintenance free.

FIELD REPAIR

None. Replace with a functional actuator.

DIMENSIONAL DATA



Dimensions shown
are in inches (mm).

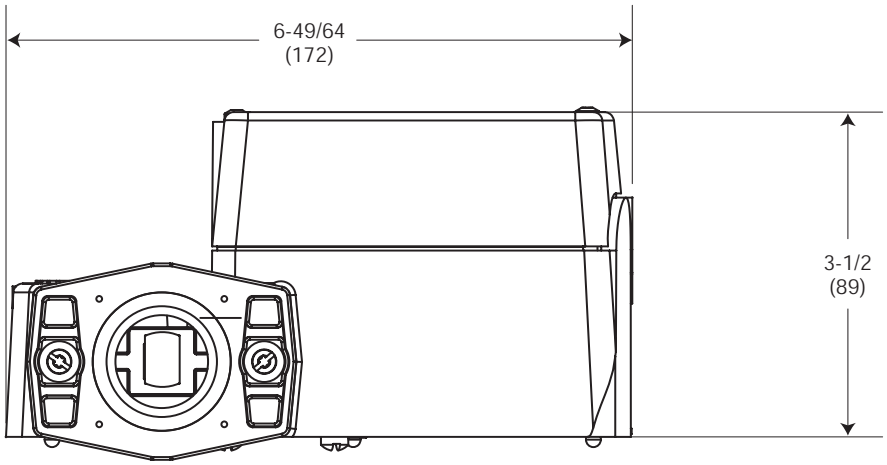


Figure-14 Mx51-710x Spring Return Valve Actuator Dimensions

Commercial Reference	Range Brand	Product Description	
MA51-71XX MS51-71XX MF51-71XX	SMARTX LINEAR ACTUATORS	MA51 2-POSITION LINEAR 105-INLBF SPRING-RETURN MS51 PROPORTIONAL LINEAR 105-INLBF SPRING-RETURN MF51 FLOATING LINEAR 105-INLBF SPRING-RETURN	

有害物质 - Hazardous Substances					
部件名称 Part Name	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚(PBDE)
属部件 Metal Parts	X	O	O	O	O	O
塑料部件 Plastic Parts	O	O	O	O	O	O
电子件 Electronic	X	O	O	O	O	O
线缆和线缆附件 Cables & cabling accessories	O	O	O	O	O	O

本表格依据 SJ/T11364 的规定编制。
O: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。
（企业可在此处，根据实际情况对上表中打 “X” 的技术原因进行进一步说明。）

This table is made according to SJ/T 11364.
O: indicates that the concentration of hazardous substance in all of the homogeneous materials for this part is below the limit as stipulated in GB/T 26572.
X: indicates that concentration of hazardous substance in at least one of the homogeneous materials used for this part is above the limit as stipulated in GB/T 26572

SIEMENS

ACVATIX™

Electro-hydraulic actuators for valves

SKD..

with a 20 mm stroke

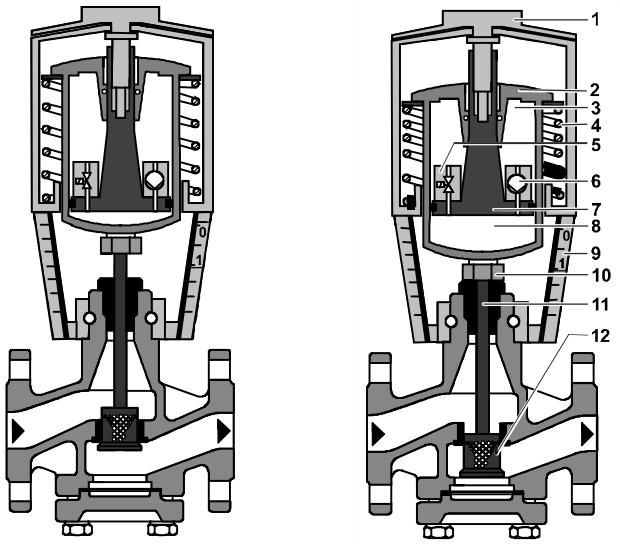
- SKD32.. Operating voltage AC 230 V, 3-position control signal
- SKD82.. Operating voltage AC 24 V, 3-position control signal
- SKD6.. Operating voltage AC 24 V
  - Control signal DC 0...10 V, 4...20 mA or 0...1000 Ω
  - SKD62/MO RS-485 for Modbus RTU communication
  - Selection of flow characteristic, position feedback, stroke calibration, LED status indication, override control
  - SKD62UA with selection of direction of operation, stroke limit control, sequence control with adjustable start point and operation range, operation of frost protection monitors QAF21.. and QAF61..
- Positioning force 1000 N
- Versions with or without spring-return function
- For direct mounting on valves; no adjustments required
- Manual adjuster and position indicator
- Optional functions with auxiliary switches, potentiometer, stem heater and mechanical stroke inverter
- SKD..U are UL-approved

Use

For the operation of Siemens 2-port and 3-port valves of the types VVF.., VVG.., VXF.. and VXG.. with a 20 mm stroke as control and safety shut-off valves in heating, ventilation and air conditioning plants.

Technical design

Principle of electro-hydraulic actuators



Valve closed Valve opened

1	Manual adjuster
2	Pressure cylinder
3	Suction chamber
4	Return spring
5	Solenoid valve
6	Hydraulic pump
7	Piston
8	Pressure chamber
9	Position indicator (0 to 1)
10	Coupling
11	Valve stem
12	Plug

Opening the valve

The hydraulic pump [6] forces oil from the suction chamber [3] to the pressure chamber [8], thereby moving the pressure cylinder [2] downwards. The valve stem [11] retracts and the valve opens. Simultaneously, the return spring [4] is compressed.

Closing the valve

Activating the solenoid valve [5] allows the oil in the pressure chamber to flow back into the suction chamber. The compressed return spring moves the pressure cylinder upwards. The valve stem extends and the valve closes.

Manual operation mode

Turning the manual adjuster [1] clockwise moves the pressure cylinder downwards and opens the valve. Simultaneously, the return spring [4] is compressed.

In the manual operation mode, the positioning signals Y and Z can further open the valve but cannot move to the 0 % stroke position of the valve. To retain the manually set position, switch off the power supply or disconnect the positioning signals Y and Z. The red indicator marked “MAN” is visible.

Note: When setting the controller to manual operation for a longer period of time, we recommend adjusting the actuator with the manual adjuster to the desired position. This guarantees that the actuator remains in this position for that period of time.

Attention: Do not forget to switch back to automatic operation after the controller is set back to automatic control.

Automatic operation mode

For automatic operation, turn the manual adjuster [1] counter-clockwise to the end stop. The pressure cylinder moves upward to the 0 % stroke position of the valve. The red indicator marked “MAN” is no longer visible.

Minimal volumetric flow

The actuator can be manually adjusted to a stroke position > 0%, allowing its use in applications requiring a constant minimal volumetric flow.

SKD32.. SKD82..

3-position control signal

The actuator is controlled by a 3-position signal either via terminals Y1 or Y2 and generates the desired stroke, which is transferred to the valve stem:

• Voltage on Y1:	Piston extends	Valve opens
• Voltage on n Y2:	Piston retracts	Valve closes
• No voltage on Y1 and Y2:	Piston and valve stem remain in the respective position	

SKD62.. SKD60

Y positioning signal

DC 0...10 V and/or 0...1000 Ω, DC 4...20 mA

The actuator is either controlled via terminal Y or override control Z. The positioning signals generate the desired stroke by means of the above described principle of operation, which is transferred to the valve stem:

• Signal Y increasing:	Piston extends	Valve opens
• Signal Y decreasing:	Piston retracts	Valve closes
• Signal Y constant:	Piston and valve stem remain in the respective position	
• Override control Z:	See Functions [→ 8]	

Frost protection monitor

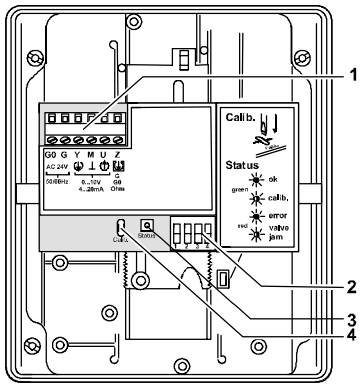
A frost protection thermostat can be connected to the SKD6.. actuator.

The added signals from the frost protection monitors QAF21.. and QAF61.. require the use of SKD62UA actuators. Notes on special programming of the electronics are described under Electronics [→ 5].

Frost protection thermostat

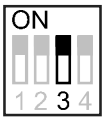
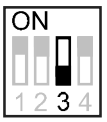
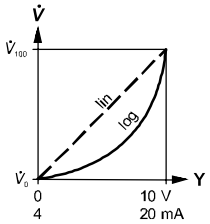
Connection diagrams for operation with frost protection thermostat or frost protection monitor can be found under Connection diagrams [→ 26].

SKD60 [1)]

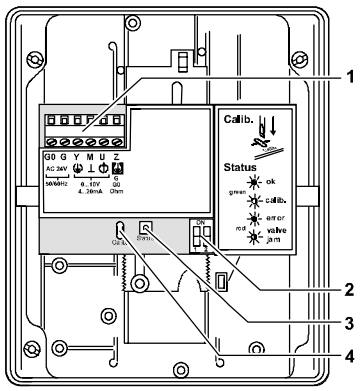


1 Connection terminals
2 DIL switches
3 LED status indication
4 Stroke calibration

1) From version ..L onward

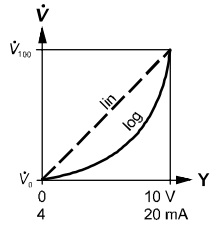
DIL switches							
	Direction of operation		**Fail-in-place (behaviour in case of control signal loss) ****		**Positioning signal Y Positioning feedback U**		**Flow characteristic**	
ON		Reverse acting		Stops at current position		DC 4...20 mA		lin = linear
OFF *		Direct acting		Closes		DC 0...10 V		log = equal percentage
					Relationship between positioning signal Y and volumetric flow			
*	Factory setting: all switches OFF							
**	Only considered when DIL switch 3 ON (control signal = DC 4…20 mA)							

SKD60 [2)], SKD62..

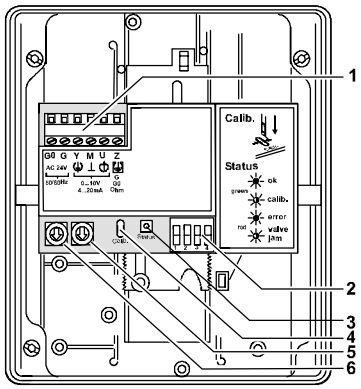


1 Connection terminals
2 DIL switches
3 LED status indication
4 Stroke calibration

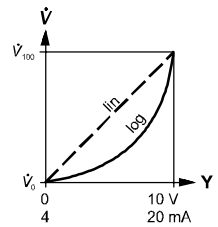
2) Up to and including version ..K

DIL switches				
	Positioning signal Y Positioning feedback U		Flow characteristic	
ON		DC 4...20 mA		lin = linear
OFF *		DC 0...10 V		log = equal percentage
			Relationship between positioning signal Y and volumetric flow	
*	Factory setting: all switches OFF			

SKD62UA



1	Connection terminals
2	DIL switches
3	LED status indication
4	Stroke calibration
5	Rotary switch UP (factory setting 0)
6	Rotary switch LO

DIL switches											
	Direction of operation		Sequence control or stroke limit control		Positioning signal Y Positioning feedback U		Flow characteristic	
ON		Reverse acting		Sequence control Signal addition QAF21../QAF61..		DC 4...20 mA		lin = linear
OFF *		Direct acting		Stroke limit control		DC 0...10 V		log = equal percentage
					Relationship between positioning signal Y and volumetric flow			
*	Factory setting: all switches OFF							

SKD62/MO

The Modbus converter is designed for analog control at 0...10 V.

Keep the analog signal setting on the actuator as is (switch 1 to OFF); adjustment not permitted.

The actuators are factory configured for equal-percentage characteristic.

DIL switch (internal actuator characteristic changeover) to "log" (switch 2 to OFF).

Functions

Notstellfunktion

The SKD32.21, SKD32.51, SKD82.51.. and SKD62.. actuators, which feature a spring-return function, incorporate a solenoid valve which opens if the control signal or power fails. The return spring causes the actuator to move to the 0% stroke position and closes the valve.

Calibration

SKD60, SKD62.., SKD62/MO

In order to determine the stroke positions 0% and 100% in the valve, calibration is required on initial commissioning.

▷ Mechanical coupling of the actuator SKD6.. with a Siemens valve.

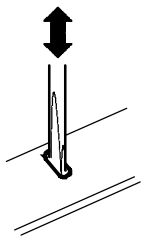
▷ ⚠ **Actuator must bin in „Automatic operation mode“ enabling stroke calibration to capture the effective 0% and 100% values.**

▷ AC 24 V power supply applied.

▷ Housing cover removed.

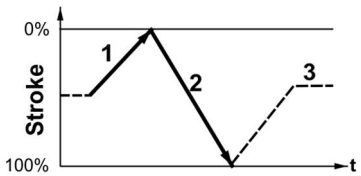
1. Short-circuit contacts in calibration slot (e.g. with a screwdriver) and trigger calibration process.
2. Actuator moves to 0% stroke position [1].
   ⇨ Valve closes.
3. Actuator moves to 100% stroke position [2].
   ⇨ Valve opens.

⇨ Measured values are stored.



LED flashes grün, positioning feedback U inactive

⇨ Normal operation:
Actuator moves to the position [3] as indicated by signals Y or Z.
LED is lit green permanently, positioning feedback U active, values correspond to the actual positions.



A red lit LED on the actuator indicates a calibration error.

The LED on the SKD62/MO cable adapter flashes red during the calibration, as the positioning signal Y and the positioning feedback U do not correspond anymore. This is interpreted as a blockage and thus indicated as an error.

If necessary, the calibration can be repeated any number of times.

LED indication of operational status

SKD60, SKD62.., SKD62/MO

The dual-colored LED indicating the operational status is visible when the cover is removed.

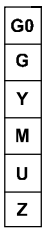
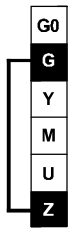
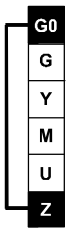
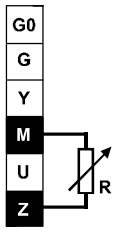
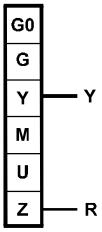
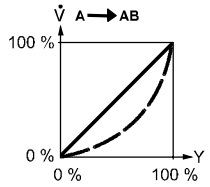
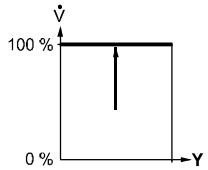
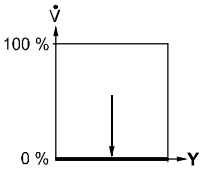
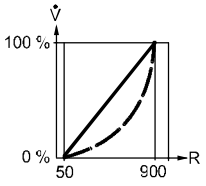
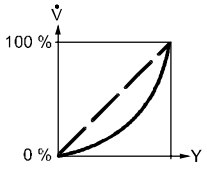
LED indication	Function	Remarks, troubleshooting
 Lit green	Normal operation	Automatic operation; everything o.k.
 Flashing green	Stroke calibration in progress	Wait until calibration is finished (LED stops flashing, will be lit green or red)
 Lit red	Faulty stroke calibration	Check mounting; restart stroke calibration (by short-circuiting calibration slot)
	Internal error	Replace electronics
 Flashing red	Inner valve jammed	Troubleshoot, check valve, restart stroke calibration
 Dark	No power supply	Check mains network, check wiring
	Electronics faulty	Replace electronics

As a general rule, the LED can only assume the states shown above – continuously lit red or green, flashing red or green, or off/dark.

Override control Z

SKD60, SKD62..

D The override control input Z can be operated in the following modes of operation:

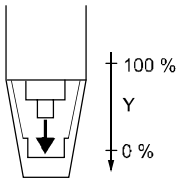
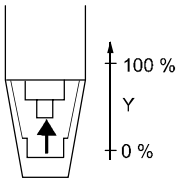
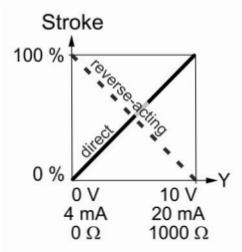
	Z-mdoe				
	No function	**Fully open**	**Closed**	**Override with 0...1000 Ω**	**Signal addition** SKD62UA only
Connections					
Transfer					
	Equal percentage or linear			Equal percentage or linear	
	• Z-contact not connected	• Z-contact directly connected to G	• Z-contact directly connected to G0	• Z-contact connected to M via resistor R • Starting position at 50 Ω End position at 900 Ω	• Z-contact connected to R of frost protection monitor QAF21.. or QAF61..
	• Valve stroke follows Y-input	• Y-input has no effect			• Valve stroke follows Y **and** R(Z) signal

Shown operation modes are based on the factory setting “direct acting”.
Y-input has no effect in Z-mode.

Selection of direction of operation

SKD60 (from version ..L), SKD62UA

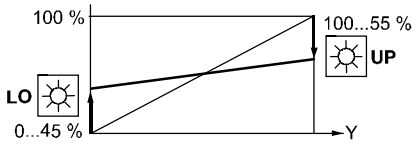
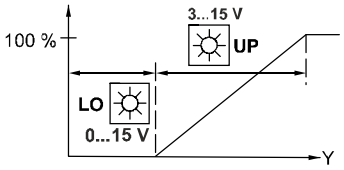
- With normally-closed valves, “direct acting” means that with a signal input of 0 V, the valve closes (applies to all Siemens valves listed under Equipment combinations [→ 12]).
- With normally-open valves, “direct acting” means that with a signal input of 0 V, the valve is open.

Direct acting		**Reverse acting**		**Stroke**
				
Input	DC 0...10 V DC 4...20 mA 0...1000 Ω	Input	DC 0...10 V DC 4...20 mA 0...1000 Ω	

The mechanical spring-return function is not affected by the direction of operation selected.

Stroke limit control and sequence control

SKD62UA

Setting the stroke limit control		Setting the sequence control
The rotary switches LO and UP can be used to apply a lower and upper limit to the stroke in increments of 3%, up to a maximum of 45%.		The rotary switches LO and UP can be used to determine the start point or the operating range of a sequence.
		

Position of LO	Lower stroke limit	Position of UP	Upper stroke limit		Position of LO	Sequence control start point	Position of UP	Sequence control operating range
0	0 %	0	100 %		0	0 V	0	10 V
1	3 %	1	97 %		1	1 V	1	10 V *
2	6 %	2	94 %		2	2 V	2	10 V **
3	9 %	3	91 %		3	3 V	3	3 V ***
4	12 %	4	88 %		4	4 V	4	4 V
5	15 %	5	85 %		5	5 V	5	5 V
6	18 %	6	82 %		6	6 V	6	6 V
7	21 %	7	79 %		7	7 V	7	7 V
8	24 %	8	76 %		8	8 V	8	8 V
9	27 %	9	73 %		9	9 V	9	9 V
A	30 %	A	70 %		A	10 V	A	10 V
B	33 %	B	67 %		B	11 V	B	11 V
C	36 %	C	64 %		C	12 V	C	12 V
D	39 %	D	61 %		D	13 V	D	13 V
E	42 %	E	58 %		E	14 V	E	14 V
F	45 %	F	55 %		F	15 V	F	15 V

* Operating range of QAF21.. (see below)

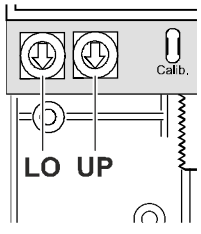
** Operating range of QAF61.. (see below)

*** The smallest adjustment possible is 3 V; control with 0...30 V is only possible via Y.

Stroke control with QAF21.. / QAF61.. signal addition

SKD62UA

Setting the signal addition			
The operating range of the frost protection monitor QAF21.. or QAF61.. can be defined with rotary switches LO and UP.			
Position of LO	**Sequence control start point**	**Position of UP**	**QAF21.. / QAF61.. operating range**
0	→	1	QAF21..
0	→	2	QAF61..



Type summary

Type			Operating voltage	Positioning signal	Spring-return		Positioning time	
					Function	Time		
SKD32.21 [1]		-	AC 230 V	3-position	yes	8 s	30 s	10 s
SKD32.50 [1]					-	-	120 s	120 s
SKD32.51 [1]					yes	8 s		
SKD82.50 [1]			AC 24 V		-	-		
SKD82.50U [2]								
SKD82.51 [1]					yes	8 s		
SKD82.51U [2]								
SKD60 [1], [3]		Standard electronics		DC 0...10 V 4...20 mA 0...1000 Ω	-	-	30 s	15 s
SKD60U [2]								
SKD62 [1]					yes	15 s		
SKD62U [2]								
SKD62UA [2], [4]		Enhanced electronics						
SKD62/MO [2]	S55195-A129	Standard-elektronik		Modbus RTU				

[1] Approbation: CE

[2] Approbation: CE, UL

[3] Enhanced functions, from version ..L onward: Direction of operation, fail-in-place

[4] Enhanced functions: Direction of operation, stroke control limit, sequence control, signal addition

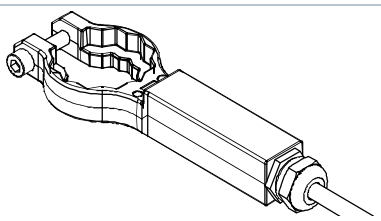
Scope of delivery

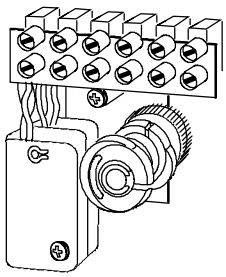
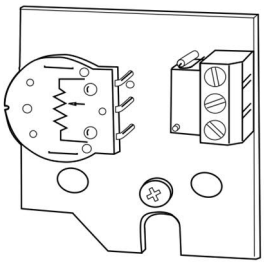
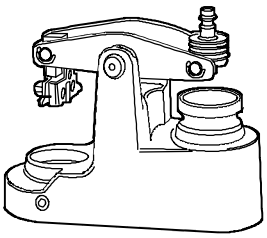
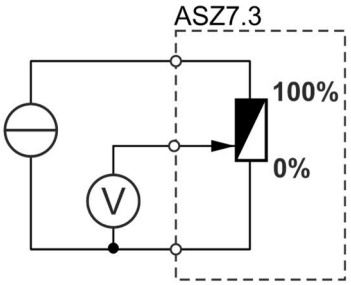
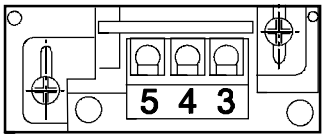
The actuator, valve and accessories are supplied in separate packaging and not assembled prior to delivery.

Accessories / spare parts

Accessories

Type	Auxiliary switch	Double auxiliary switch	Potentiometer 1000 Ω	Stem heater AC 24 V	Mechanical stroke inverter
	ASC1.6	ASC9.3	ASZ7.3	ASZ6.6 (S55845-Z108)	ASK50
	Max. 2				
SKD32..	-	Max.1	Max.1	Max.1	Max.1
SKD82					
SKD6..	Max.1	-	-		

SKD..	**ASZ6.6** (S55845-Z108) Stem heater • For media below 0 °C • Mount between valve and actuator	

SKD32.. **SKD82..**	**ASC9.3** Double auxiliary switch	**ASZ7.3** Potentiometer	**ASK50** Mechanical stroke inverter
			
	Adjustable switching points	0…1000 Ω	0% actuator stroke corresponds to 100% valve stroke Mount between valve and actuator
	Note: ASZ7.3	For the combination SIMATIC S5/S7 and use of positioning feedback, we recommend actuators with DC 0...9.8 V feedback signals. The signal peaks that occur in the potentiometer ASZ7.3 may result in error messages on Siemens SIMATIC. This is not the case when combined with Siemens HVAC controllers. The reason is that SIMATIC has a higher resolution and faster response time. Use the potentiometer as voltage divider on the 3-wire connection. Powering the potentiometer over the wiper may shorten the life cycle of the potentiometer. Signal peaks increase in frequency and scope over the lifespan in this operating mode. 	
SKD60 **SKD62..**	ASC1.6 Auxiliary switch  Switching point 0...5 % stroke		

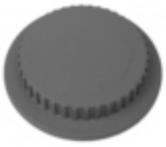
For more information, see Technical data [→ 19]

Ordering (example)

Type / Stock number [1]	Designation	Number of pieces
SKD62/MO / S55195-A129	Actuator Modbus RTU	1
ASC1.6	Auxiliary switch	1

[1] Specify stock number if available.

Spare parts

Actuator	Cover	Hand control [1]	Control unit
			
SKD32.21	410456348	426855108	-
SKD32.50			
SKD32.51			
SKD82.50			
SKD82.50U			
SKD82.51			
SKD82.51U			
SKD60			466857598
SKD60U			
SKD62			466857488
SKD62U			
SKD62UA			466857518
SKD62/MO			466857488

[1] Hand control, blue with mechanical parts

Equipment combinations

2-port valves VV.. (control or safety shut-off valves)

Valve type		DN	PN class	k_{vs} [m³/h]	Data sheet
VVF21.. [1]	Flannged	25...80	6	1.9...100	N4310
VVF22..				2.5...100	N4401
VVF31.. [1]		15...80	10		N4320
VVF32..				1.6...100	N4402
VVF40.. [1]			16	1.9...100	N4330
VVF41.. [1]		50		19... 31	N4340
VVF42..		15...80		1.6...100	N4403
VVF52.. [1]		15...50	25	0.16...25	N4373
VVF53..		15...40		0.16...40	N4405
VVF61..		15...50	40	0.19...31	N4382
VVF63..		15...50		0.2...36	A6V11459527
VVG41..	Threaded	15...50	16	0.63...40	N4363

Admissible differential pressures Δp_{max} and closing pressures Δp_s: cf. relevant valve data sheets

[1] Valves are no longer available

3-port valves VX.. (control valves for “mixing” and “distribution”)

Valve type		DN	PN class	k_{vs} [m³/h]	Data sheet
VXF21.. [1]	Flansch	25...80	6	1.9...100	N4410
VXF22..				2.5...100	N4401
VXF31.. [1]		15...80	10		N4420
VXF32..				1.6...100	N4402
VXF40.. [1]			16	1.9...100	N4430
VXF41.. [1]		15...50		1.9...31	N4440
VXF42..		15...80		1.6...100	N4403
VXF53..		15...50	25	1.6...40	N4405
VXF61..			40	1.9...31	N4482
VXF63..				0.2...36	A6V11459527
VXG41..	Gewinde		16	1.6...40	N4463

Admissible differential pressures Δp_{max} and closing pressures Δp_s: cf. relevant valve data sheets

[1] Valves are no longer available

Third-party valves with strokes between 6...20 mm can be motorized, provided they are “closed with the de-energized” fail-safe mechanism and provided that the necessary mechanical coupling is available. For SKD32.. and SKD82.. the Y1 signal must be routed via an additional, freely adjustable end switch (ASC9.3) to limit the stroke.

We recommend that you contact your local Siemens office for the necessary information.

Product documentation

SKD..				Accessories	Mounting instructions	
Mounting instructions SKD..	M3250	74 319 0325 0		**ASC1.6**	G4563.3	4 319 5544 0
		74 319 0326 0		**ASC9.3**	G4561.3	4 319 5545 0
		(Setting instructions Standard electronics)		**ASK50**	M4561.5	4 319 5549 0
		A5W00027551		**ASZ7.3**		74 319 0247 0
		(Mounting instructions Modbus converter)		**ACT control unit**	M4568	74 319 0554 0
		A6V12057657		**QAF21..**		74 319 0399 0
		(Communication profiles Modbus)		**ASZ6.6**	M4501.1	74 319 0750 0

Related documents such as environmental declarations, CE declarations, etc., can be downloaded at the following Internet address:

http://siemens.com/bt/download

Sicherheit

⚠ CAUTION

National safety regulations

Failure to comply with national safety regulations may result in personal injury and property damage.

- Observe national provisions and comply with the appropriate safety regulations.

⚠ WARNING

Tensioned spring return

Opening the actuator housing can release the highly tensioned return spring, which can cause flying parts and injuries.

- Do not open the actuator housing.

⚠ WARNING

Risk of injury through broken housing or cover

Dismounting the actuator with broken housing from the valve can release the highly tensioned spring return, which can cause flying parts and injury.

- NEVER dismount actuator from valve.
- Dismount valve-actuator combination (control device) as complete unit.
- Disassembly only by qualified personnel.
- Send the control device along with an error report to the local Siemens office for analysis and disposal.
- Mount new control device (valve and actuator) properly.

⚠ WARNING

Risk of burns from hot actuator brackets

The actuator brackets on heating plants can also become hot from the contact with the hot valve during operation. The temperature of the actuator bracket can reach 100 °C.

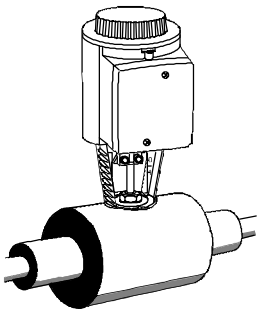
When servicing the actuator:

- Switch off both pump and operating voltage.
- Close the main shutoff valve in the piping.
- Release pressure in the pipes and allow them to cool off completely.

Der elektrische Anschluss ist gemäss den örtlichen Vorschriften für Elektroinstallationen und dem Kapitel Anschlussschaltpläne [→ 26] durchzuführen.

⚠	*NOTE*
	Using a safety limiter Failure to comply with applicable regulations for cable insulation may result in the suspension of the safety limiter function. • Compliance with all applicable regulations for cable insulation must be ensured by the plant operator.

	⚠ WARNING
	Risk of injury and fire from hot device parts For media below 0 °C, the stem heater ASZ6.6 keeps the valve stem ice-free. In this case, the actuator bracket and the valve stem must not be insulated in order to ensure air circulation. Touching heated parts without safety measures leads to burns. • For safety reasons, the steam heater is operated with AC 24 V / 30 W. • Recommendation: For media above 140 °C, the valve must be insulated.



Observe admissible temperatures, see Use [→ 2] and Technical data [→ 19].

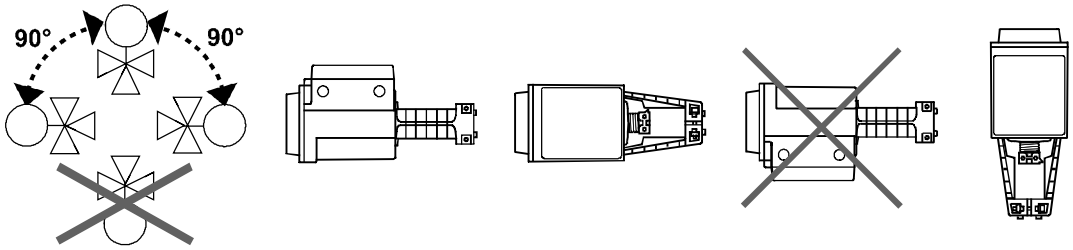
If an auxiliary switch is used, its switching point should be indicated on the plant schematic.

Every actuator must be driven by a dedicated controller, see Connection diagrams [→ 26].

Mounting

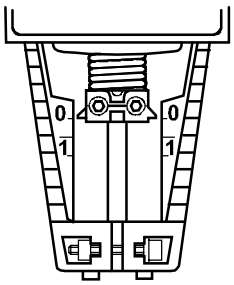
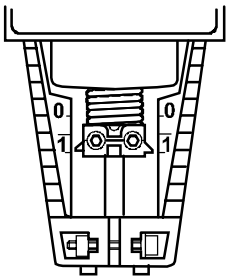
Mounting instructions 74 319 0324 0 for fitting the actuator to the valve and A5W00027551 for SKD62/MO are enclosed in the actuator packaging. The instructions for accessories are enclosed with the accessories themselves (see Product documentation [→ 13]).

Mounting positions

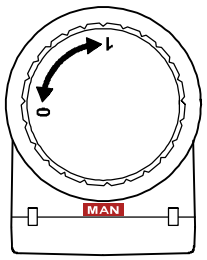
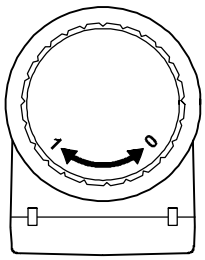


Commissioning

When commissioning the system, check the wiring and functions, and set any auxiliary switches and potentiometers as necessary, or check the existing settings.

Coupling fully retracted → stroke = 0 %		Coupling fullyextended → stroke = 100 %	

The manual adjuster must be rotated counter-clockwise to the end stop, i.e. until the red indicator marked “MAN” is no longer visible. This causes the Siemens valvse, types VVF.., VVG.., VXF.. and VXG.. to close (stroke = 0 %).

Manual operation	Automatic operation
	
“MAN”	“AUTO”

Maintenance

The actuators are maintenance-free.

When **servicing** the control device:

⚠ WARNING

Verbrennungsgefahr durch heisse Antriebskonsole

The actuator brackets on heating plants can also become hot from the contact with the hot valve during operation. The temperature of the actuator bracket can reach 100 °C.

When servicing the actuator:

- Switch off both pump and operating voltage.
- Close the main shutoff valve in the piping.
- Release pressure in the pipes and allow them to cool off completely.

⚠ WARNING

Risk of injury

- Disconnect electrical connections from the terminals as neede.
- The actuator must be properly installed prior to recommissioning the valve.

Recommendation SKD6..:

Trigger stroke calibration after maintenance.

Repair:

See Spare parts [→ 12]

⚠ WARNING

Risk of injury through broken housing or cover

Dismounting the actuator with broken housing from the valve can release the highly tensioned spring return, which can cause flying parts and injury.

- NEVER dismount actuator from valve.
- Dismount valve-actuator combination (control device) as complete unit.
- Disassembly only by qualified personnel.
- Send the control device along with an error report to the local Siemens office for analysis and disposal.
- Mount new control device (valve and actuator) properly.

Disposal

⚠ WARNUNG

Tensioned spring return

Opening the actuator housing can release the highly tensioned return spring, which can cause flying parts and injuries.

- Do not open the actuator housing.

The device is considered an electronic device for disposal in accordance with the European Guidelines and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

Warranty

Technical data on specific applications are valid only together with Siemens products listed under "Equipment combinations". Siemens rejects any and all warranties in the event that third-party products are used.

Technical data

Power supply			
Operating voltage			
	SKD32..		AC 230 V ± 15 %
	SKD82..		AC 24 V ± 20 % (SELV/PELV)
	SKD6..		
	SKD62/MO		
Frequency			50 / 60 Hz
Maximum power consumption at 50 Hz			
	SKD32.21		16 VA / 12 W
	SKD32.50		11 VA / 8 W
	SKD32.51		17 VA / 12 W
	SKD82.50, SKD82.50U		9 VA / 7 W
	SKD82.51, SKD82.51U		14 VA / 10 W
	SKD60..		10 VA / 8 W
	SKD62..		14 VA / 10 W
External supply cable fuse			
	SKD32..		Min. 0.5 A, slow Max. 6 A slow
	SKD82..		Min. 1 A, slow Max. 10 A slow
	SKD6..		

Function data			
Positioning time at 50 Hz [1]			
	SKD32.21	Opening	30 s
		Closing	10 s
	SKD32.5.. SKD82.5..	Opening, closing	120 s
	SK6..	Opening	30 s
		Closing	15 s
Spring-return time [1]			
	SKD32..		8 s
	SKD82..		
	SKD62..		15 s
Positioning force			1000 N
Nominal stroke			20 mm
Maximum permissible medium temperature (valve fitted)			-25...150 °C
			< 0 °C: Requires stem heater ASZ6.6

Signal inputs / signal outputs		
Control signal		
	SKD32..	3-position
	SKD82..	
	SKD6..	DC 0…10 V
		DC 4…20 mA
		0…1000 Ω

Signal inputs / signal outputs			
Positioning signal Y SK6..			
	Input impedance	DC 0…10 V	100 kΩ
		DC 4…20 mA	240 Ω
	Signal resolution		< 1 %
	Hysteresis		1 %
Override control Z SK6..			
	Resistor		1000 Ω
	Z not connected, priority terminal Y		No function
	Z connected directly to G		Max. stroke 100 %
	Z connected directly to G0		Min. stroke 0 %
	Z connected to M via 0...1000 Ω		Stroke proportional to R
Position feedback U SK6..			
	Load impedance	DC 0…9,8 V	> 10 kΩ
		DC 4…19.6 mA	< 500 Ω

Enhanced functions SKD60 [2], SKD62UA			
Selection of direction of operation			
	SKD60, SKD62UA	Direct-acting / reverse-acting	DC 0...10 V / DC 10...0 V
			DC 4...20 mA / DC 20...4 mA
			0...1000 Ω / 1000...0 Ω
Stroke limit control			
	SKD62UA	Range of lower limit	0...45 % adjustable
		Range of upper limit	100...55% adjustable
Sequence control			
	SKD62UA	Terminal Y	
		Starting point of sequence	0...15 V adjustable
		Operating range of sequence	3...15 V adjustable
Signal addition			
	SKD62UA	Z connected to R of	
		Frost protection monitor QAF21..	0…1000 Ω, added to Y signal
		Frost protection monitor QAF61..	DC 1,6 V, added to Y signal

Communication SKD62/MO			
Communication protocol			
	Modbus RTU		RS-485, not galvanically isolated
	Number of nodes		Max. 32
	Adress range		1...248 / 255
		Factory setting	255
	Transmission formats		1-8-E-1 / 1-8-O-1 / 1-8-N-1 / 1-8-N-2
		Factory setting	1-8-E-1
	Baud rates (kBaud)		Auto / 9.6 / 19.2 / 38.4 / 57.6 / 76.8 / 115.2
		Factory setting	Auto
	Bus termination		120 Ω electronically switchable
		Factory setting	Off

Electrical connections and connecting cable			
Wire cross-sectional area			0.5...2.5 mm², AWG 21...14 [3]
Cable entries			4 x M20 (∅ 20.5 mm)
	With knockouts for standard ½" conduit connectors (∅ 21.5 mm)		Mit Ausbrechöffnungen für ½" Schlauchverbindungen (Ø 21,5 mm)
	SKD62/MO		Fixed connection cable
		Cable length	0.9 m
		Number of cores	5 x 0.75 mm²

Degree and class of protection		
Protection class		As per EN 60730
	Automatic action	Typ 1AA / Typ 1AC / Modulation Action
	Pollution degree	2
Housing protection upright to sideways		IP 54 as per EN 60529

Environmental conditions			
Operation			IEC 60721-3-3
	Climatic conditions		Class 3K5
		Temperature, general	-15...<50 °C
		Humidity (non-condensing)	5...95 % r.h.
Transportation			IEC 60721-3-2
	Climatic conditions		Class 2K3
		Temperature	-30...65 °C
		Humidity (non-condensing)	5...95 % r.h.
Storage			IEC 60721-3-1
	Climatic conditions		Class 1K3
		Temperature	-15...50 °C
		Humidity (non-condensing)	-5...95 % r.h.

Directives and standards		
Product standarad		EN 60730-x
Electromagnetic compatibility (Applications)		For use in residential, commerical, and industrial environments
EU conformity (CE)		A5W00007752 [4]
RCM conformity		A5W00007898 [4]
EAC conformity		Eurasia conformity for all SKD..
UL, cUL	AC 230 V	-
	AC 24 V	UL 873 http://ul.com/database

Environmental compatibility
The product environmental declarations CE1E4561enX1 (SKD3.., SKD8..) [4], CE1E4561enX2 (SKD6..) [4] and A6V101083254 (external Modbus converter) [4] contain data on RoHS compliance, materials composition, packaging, environmental benefit and disposal.

Dimensions / weight		
Dimensions		See Dimensions [→ 30]
Weight		
	SKD32.21	3.65 kg
	SKD32.50	3.60 kg
	SKD32.51	3.65 kg
	SKD82.50	3.60 kg
	SKD82.50U	3.85 kg
	SKD82.51	3.65 kg
	SKD82.51U	3.90 kg
	SKD60 SKD62, SKD62/MO	3.60 kg
	External Modbus converter	0.15 kg
	SKD62U SKD62UA	3.85 kg
	Stroke inverter ASK50	1.10 kg

Materials	
Housing	Die-cast aluminium
Bracket	
Housing box	Plastic
Manual adjuster	

Accessories			
Auxiliary switch ASC1.6			
	SKD6..	Switching capacity	AC 24 V, 10 mA....4 A resistive, 2 A inductive
Double auxiliary switch ASC9.3			
	SKD32.., SKD82..	Switching capacity per auxiliary switch	AC 250 V, 6 A resistive, 2.5 A inductive
Potentiometer ASZ7.3			
	SKD32.., SKD82..	Change in overall resistance of potentiometer at nominal stroke	0...1000 Ω
Stem heater ASZ6.6			
		Operating voltage	AC 24 V ± 20 %
		Power consumption	40 VA / 30 W
		Inrush current	Max. 8.5 A (Max. temperature 85 °C / 185 °F

1) At room temperature (23 °C); low ambient temperatures or high Δp may prolong these times

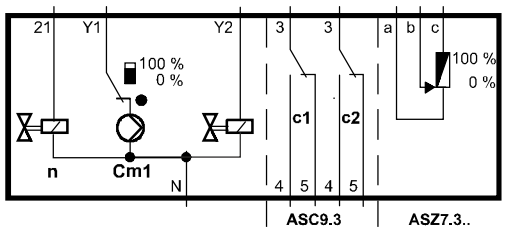
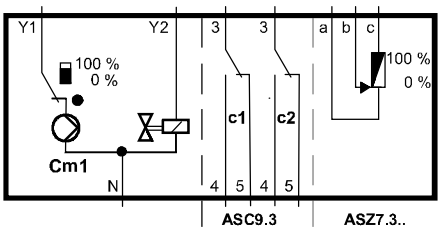
2) From version ..L onward

3) AWG = American wire gauge

4) The documents can be downloaded at http://www.siemens.com/bt/download

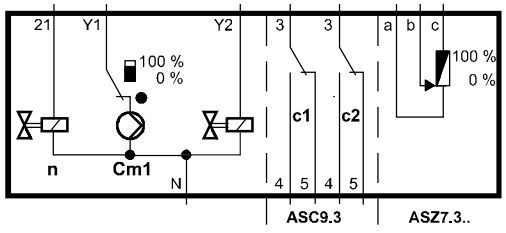
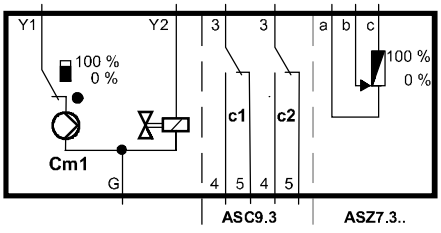
Internal diagrams

SKD32..

SKD32.21 SKD32.51	SKD32.50
AC 230 V 3-position	
	

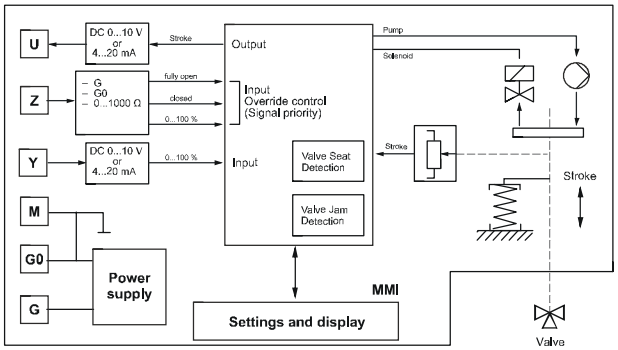
Cm1	End switch
n	Solenoid valve for spring-return
c1, c2	ASC9.3 double auxiliary switch
a, b, c	ASZ7.3 potentionmeter
Y1	Positioning signal „open“
Y2	Positioning signal „close“
21	Spring-return function
N	Neutral conductor

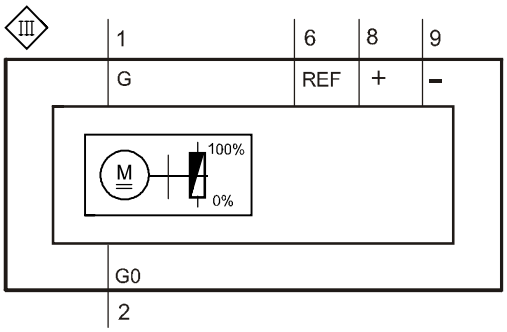
SKD82..

SKD82.51	SKD82.50
AC 24 V 3-position	
	

Cm1	End switch
n	Solenoid valve for spring-return
c1, c2	ASC9.3 double auxiliary switch
a, b, c	ASZ7.3 potentionmeter
Y1	Positioning signal „open“
Y2	Positioning signal „close“
21	Spring-return function
G	System potential

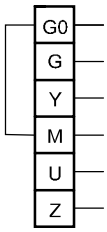
SKD6..

SKD60, SKD62 SKD62U, SKD62UA
AC 24 V
DC 0...10 V 4...20 mA 0...1000 Ω


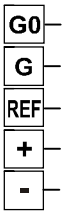
SKD62/MO
AC 24 V
Modbus RTU


U	Position indication	**REF**	Reference line (Modbus RTU)
Z	Override control	**+**	Bus + (Modbus RTU)
Y	Positioning signal	-	Bus - (Modbus RTU)
M	Measuring neutral		
	G0	Operating voltage AC 24 V: System neutral (SN)	
	G	Operating voltage AC 24 V: System potential (SP) Switching without power as a spring-return function	

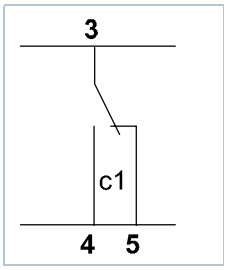
SKD6..

	AC 24 V	DC 0...10 V 4...20 mA 0...1000 Ω
	System neutral (SN)	
	System potential (SP)	
	Positioning signal DC 0...10 (30) V or DC 4...20 mA	
	Measuring neutral (= G0)	
	Position indication DC 0...10 V oder DC 4...20 mA	
	Override control (Functions [→ 8])	

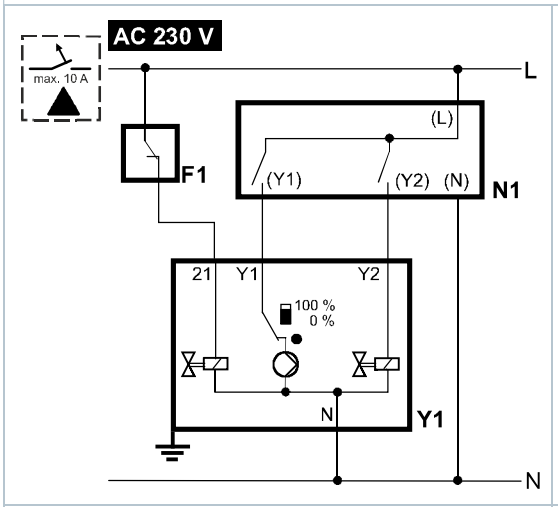
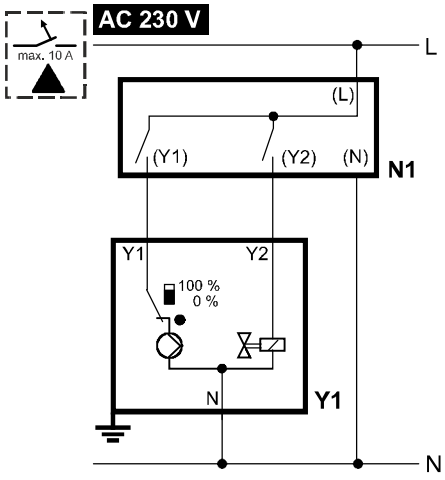
SKD62/MO

	AC 24 V	Modbus RTU Connection cable
	System neutral (SN)	Black
	System potential (SP)	Red
	Reference line (Modbus RTU)	Violet
	Bus + (Modbus RTU)	Gray
	Bus - (Modbus RTU)	Pink

Auxiliary switch ASC1.6

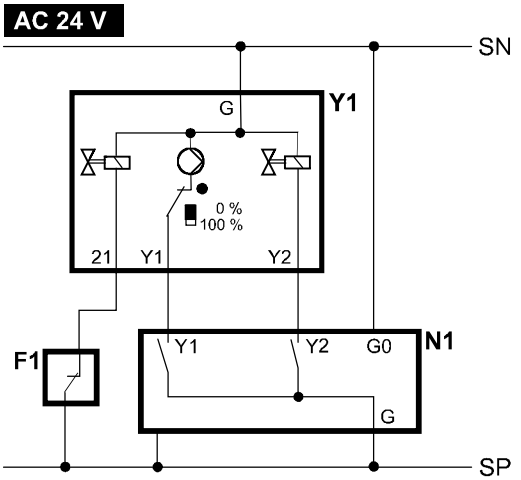
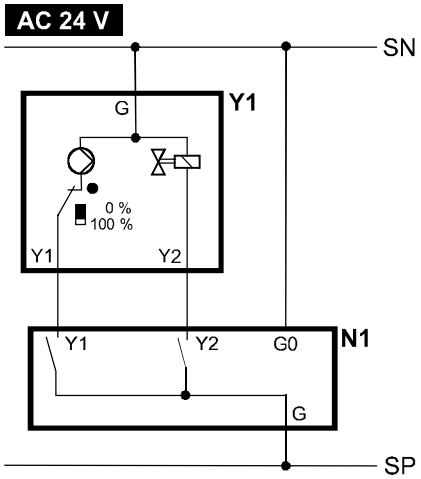
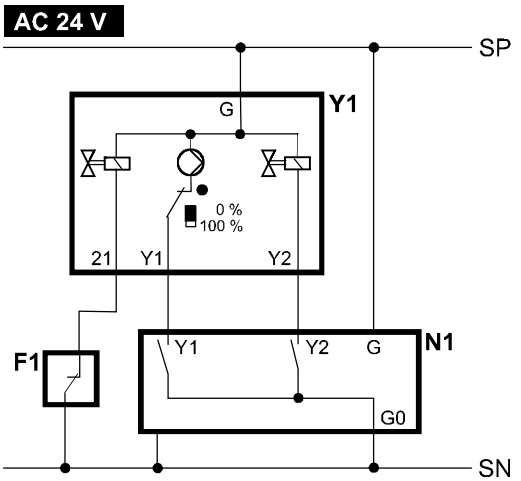
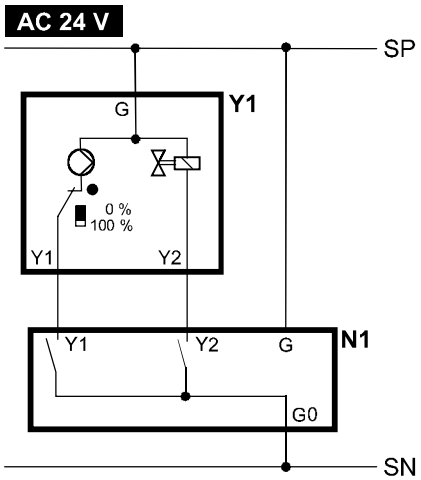


SKD32..

SKD32.21 SKD32.51	SKD32.50
AC 230 V 3-position	
	

F1	Safety limiter (e.g. temperature limiter)			**Y1**	Positioning signal „open“
N1, N2	Controller	**L**	Phase	**Y2**	Positioning signal „close“
Y1, Y2	Actuators	**N**	Neutral	**21**	Spring-return function

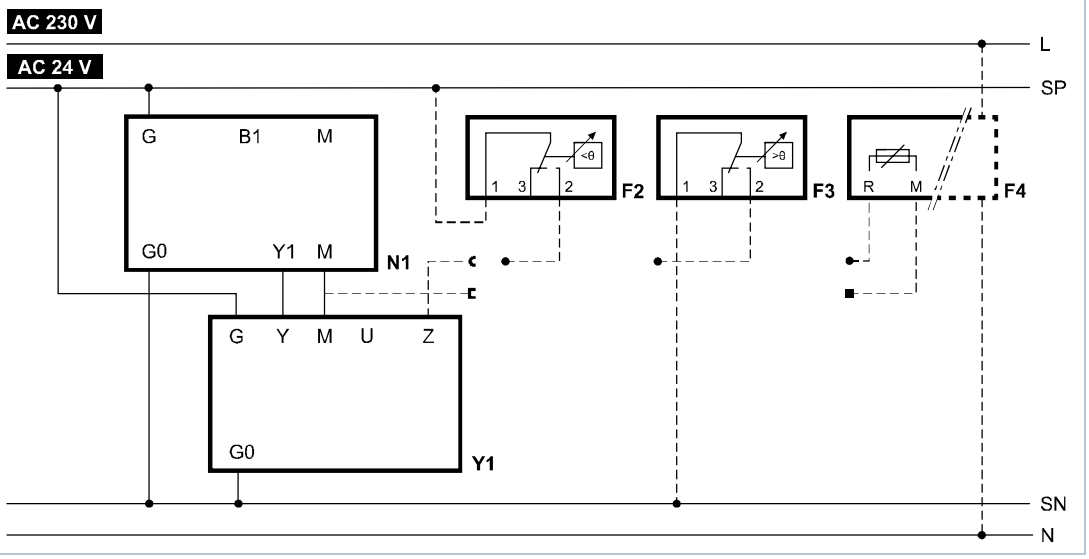
SKD82..

SKD82.51, SKD82.51U	SKD82.50, SKD82.50U
AC 24 V 3-position	
	
	

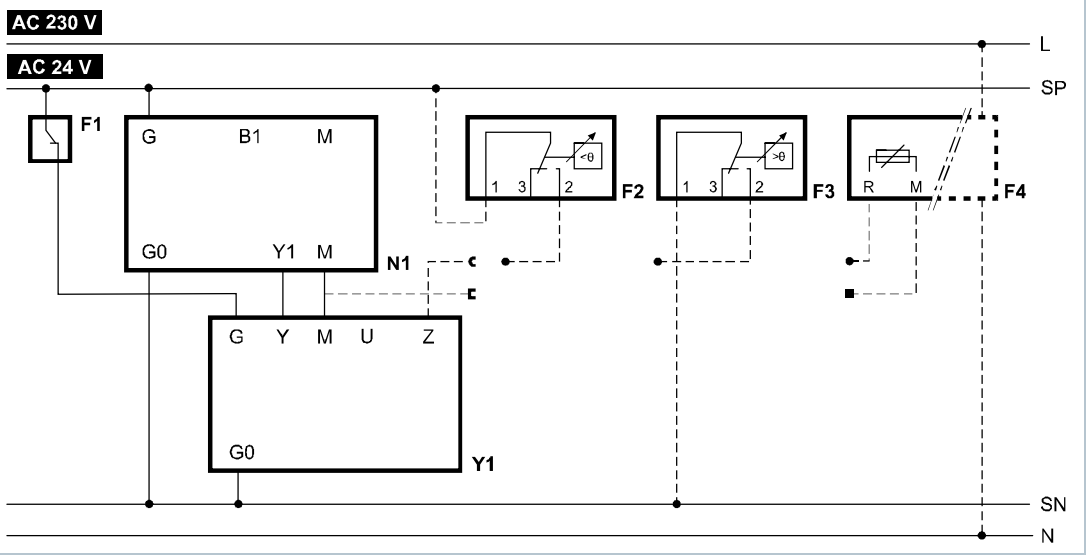
F1	Safety limiter (e.g. temperature limiter)			**(Y1), (Y2)**	Controller contacts
		SP	System potential AC 24 V	**Y1**	Positioning signal „open“
N1, N2	Controller	**SN**	System neutral	**Y2**	Positioning signal „close“
Y1, Y2	Actuators			**21**	Spring-return function

SKD6..

SKD60	
AC 24 V	DC 0...10 V 4...20 mA 0...1000 Ω

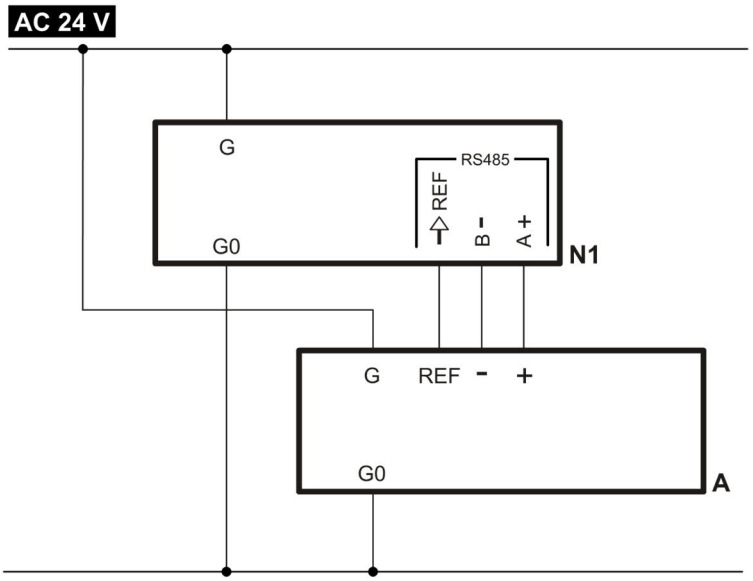


SKD62, SKD62U, SKD62UA	
AC 24 V	DC 0...10 V 4...20 mA 0...1000 Ω



Y1	Actuator			**F3**	Temperature detector
N1	Controller			**F4**	Frost protection monitor with 0...1000 Ω signal output, e.g. QAF21.. or QAF61.. (only SKB62UA) *)
F1	Safety limiter (e.g. temperature limiter)			**G (SP)**	System potential AC 24 V
F2	Frost protection thermostat			**G0 (SN)**	System neutral
	Terminals:	1-2	Frost hazard/sensor is interrupted (thermostat closes with frost)		
		1-3	Normal operation		

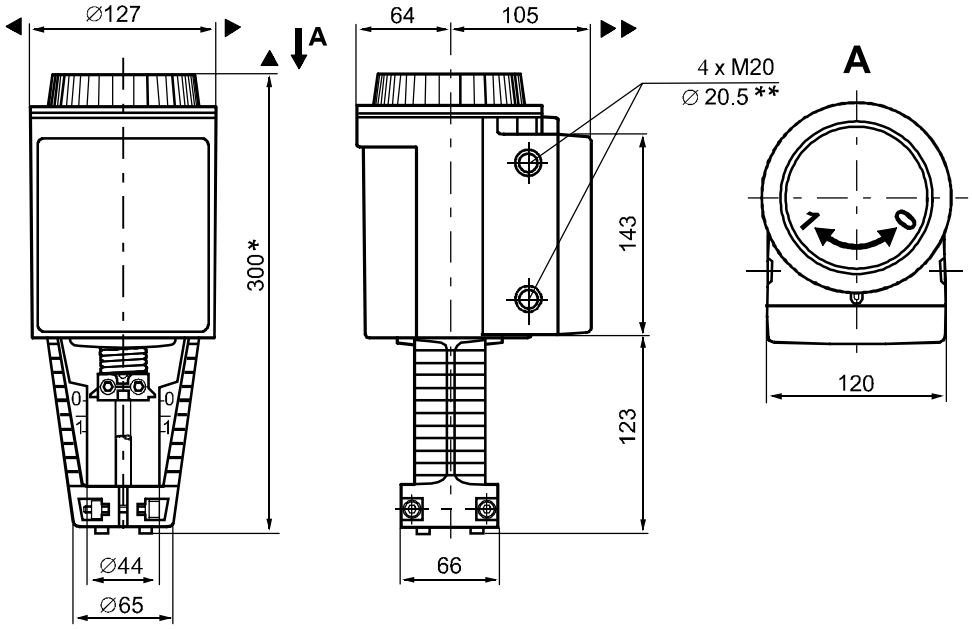
*) Only SKD62UA: only with sequence control and the appropriate selector switch settings, see Electronics [→ 5], Functions [→ 6]

SKD62/MO
AC 24 V Modbus RTU


A	Actuator
N1	Controller
G	System potential
G0	System neutral
REF	Reference line (Modbus RTU)
+	Bus + (Modbus RTU)
-	Bus - (Modbus RTU)

⚠	*HINWEIS*
	Using safety limiter F1 When using the safety limiter F1, ensure that no mistakes may occur on cable insulation that may cancel out the temperature limiter function (applies to both 230 V as well as 24 V types). • For SN earthing (e.g. PELV) comply under all circumstances with the note above.

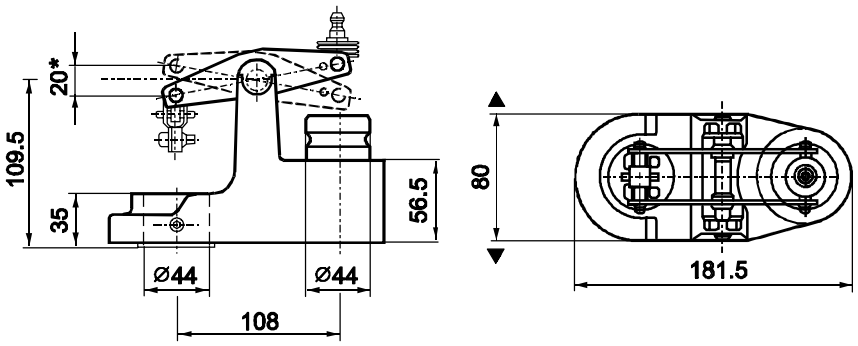
Actuator



All dimensions in mm

*	Height of actuator from plate **without** stroke inverter **ASK50 = 300 mm** Height of actuator from plate **with** stroke inverter **ASK50 = 357 mm**
**	**SKD..U: with knockouts for standard ½" conduit connectors (∅ 21.5 mm)**
▶	> 100 mm, um clearance form ceiling or wall for mounting
▶▶	> 200 mm, connection, operation, maintenance, etc.

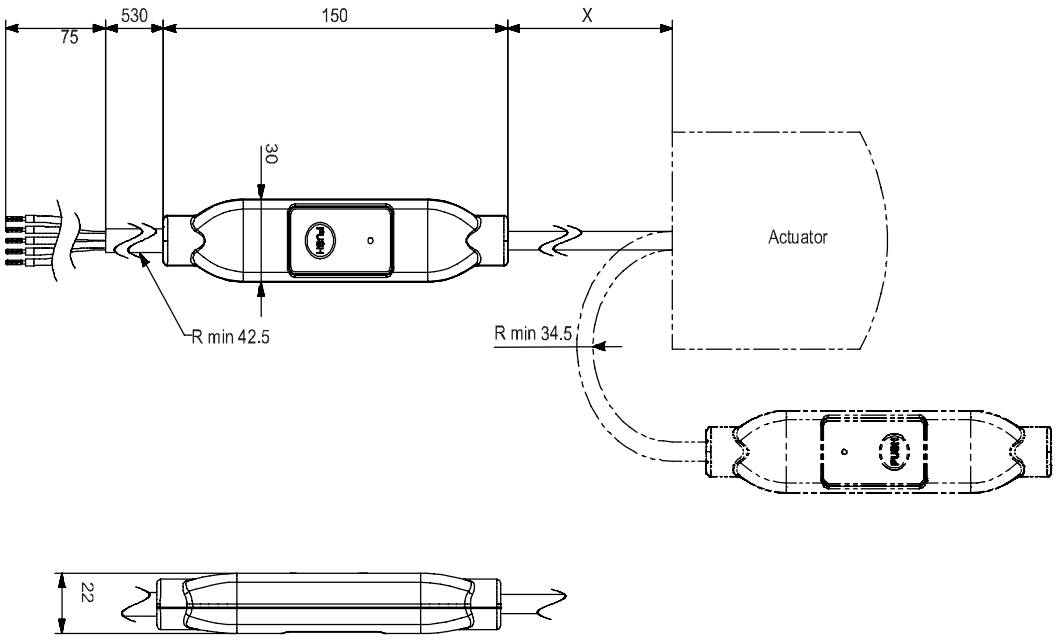
Stroke inverter ASK50



All dimensions in mm

*	Maximum stroke = 20 mm

External Modbus converter



All dimensions in mm

X	250 mm

Revision numbers

Type	Valid from rev. no.	Type	Valid from rev. no.
SKD32.50	..F	SKD62	..H
SKD32.51	..F	SKD62U	..H
SKD32.21	..F	SKD60	..H
SKD82.50	..F	SKD62UA	..H
SKD82.50U	..F	SKD62/MO	..I
SKD82.51	..F		
SKD82.51U	..F		

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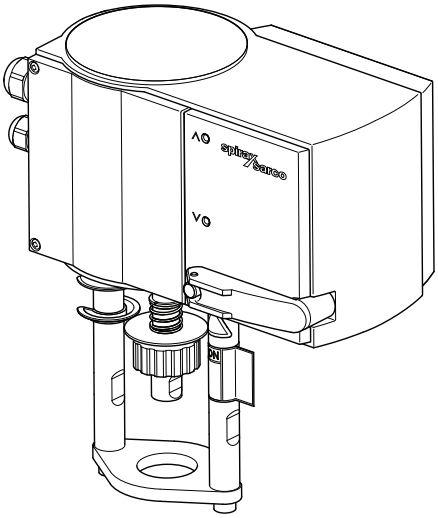
AEL3
Electric Linear Actuators
Installation and Maintenance Instructions



1. Safety information
2. General product information
3. Installation
4. Commissioning
5. Maintenance

1. Safety information

Safe operation of this product can only be guaranteed if it is properly installed, commissioned, used and maintained by qualified personnel (see Section 1.13) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

See separate Installation and Maintenance Instructions for the control valve.

If the actuator is handled improperly or not used as specified, the resultant may:

- **cause danger of the life and limb of the third party,**
- **damage the actuator and other assets belonging to the owner,**
- **hinder the performance of the actuator.**

1.1 Wiring notes

Every effort has been made during the design of the actuator to ensure the safety of the user, but the following precautions must be followed:

i) **Maintenance personnel must be suitably qualified in working with equipment containing hazardous live voltages.**

ii) **Ensure correct installation. Safety may be compromised if the installation of the product is not carried out as specified in this manual.**

iii) **Isolate the actuator from the mains supply before opening the unit.**

iv) **The actuator is designed as an installation category II product, and is reliant on the building installation for overcurrent protection and primary isolation.**

v) **Wiring should be carried out in accordance with IEC 60364 or equivalent.**

vi) **Fuses should not be fitted in the protective earth conductor. The integrity of the installation protective earth system must not be compromised by the disconnection or removal of other equipment.**

vii) **A disconnecting device (switch or circuit breaker) must be included in the building installation. This must be in close proximity to the equipment and within easy reach of the operator.**

- **There must be a 3 mm contact separation in all poles.**
- **It must be marked as the disconnecting device for the actuator.**
- **It must not interrupt the protective earth conductor.**
- **It must not be incorporated into a mains supply cord.**
- **The requirements for the disconnecting device are specified in EN 60947-1 and EN 60947-3 or equivalent.**

viii) **The disconnecting device must not be located in such a way that the device is made difficult to operate.**

1.2 Safety requirements and electromagnetic compatibility

This product is CE marked. It complies with LV Directive 2014/35/EU, EN60730-1, EN60730-2-14.
This product complies with EMC Directive 2014/30/EU, EN61000-6-2, EN6100-6-4

The product may be exposed to interference above the limits of industrial immunity if:

- **The product or its wiring is located near to a radio transmitter.**
- **Excessive electrical noise occurs on the mains supply.**
- **Cellular telephones and mobile radios may cause interference if used within approximately one metre of the product or its wiring. The actual separation necessary will vary according to the power of the transmitter.**
- **Power line protectors (ac) should be installed if mains supply noise is likely.**
- **Protectors can combine filtering, suppression, surge and spike arrestors. For a copy of the declaration of conformity contact Spirax Sarco.**

1.3 Intended use

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended use / application.

i) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous over pressure or over temperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.

ii) Determine the correct installation situation.

iii) Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.

iv) These actuators are not suitable for use as safety devices according to the pressure equipment directive 2014/68/EU or the machinery directive 2006/42/EU.

1.4 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

1.5 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

1.6 Hazardous environment around the product

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery. Do not use the actuators in explosive atmosphere according the ATEX directive 2014/34/EU.

1.7 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk?

Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

1.8 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labelling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.9 Temperature

Allow time for temperature to normalise after isolation to avoid danger of burns.

1.10 Tools and consumables

Before starting work ensure that you have suitable tools and / or consumables available. Use only genuine Spirax Sarco replacement parts.

1.11 Protective clothing

Consider whether you and/or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high / low temperature, radiation, noise, falling objects, and dangers to eyes and face.

1.12 Permits to work

All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.

Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.

Post 'warning notices' if necessary.

1.13 Handling

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

1.14 Residual hazards

In normal use the external surface of the product may be very hot. If used at the maximum permitted operating conditions the surface temperature of some products may reach temperatures of 90°C (194°F).

Many products are not self-draining. Take due care when dismantling or removing the product from an installation (refer to 'Maintenance instructions').

1.15 Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

1.16 Disposal

Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

1.17 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

2. General product information

2.1 Use

AEL3 electric linear actuators are for use with Spira-trol two-port control valves and QL three-port valves. Actuators will normally be supplied fitted to the control valve. When supplied separately, ensure the actuator selected is capable of giving the force necessary to close the two-port or three-port control valve against the expected differential pressure. See the appropriate product specific Technical Information Sheet for full details of the control valve.

The AEL3 actuators are motor operated actuators for on-off, modulating or special control of valves for regulating control, cold, warm or hot water, steam or air and equivalent applications. Typical use is for HVAC applications.

AEL3 actuators are available with 3 supply variants, 24 Vac/dc as standard, 230 Vac or 100-110 Vac, available with additional modules, all being suitable for a VMD (Valve Motor Drive) input power signal or a 4-20 mA or 0-10 Vdc control signal. The actuator has 3 speed options all selected via dip switches in the actuator. Full details of the actuator types, and reference numbers, are given in Table 1 below:

Table 1. AEL3 actuator nomenclature

Product	**A**	= Actuator
Type	**E**	= Electric
Movement	**L**	= Linear
Series	**3**	
Failure mode	**E**	= Spring to extend
	R	= Spring to retract
	X	= No spring
Thrust (kN)	**2**	
Stroke (mm)	**20**	
Selectable speed	2 s/mm = 0.5mm/s selectable in the actuator via dip switches	
	4 s/mm = 0.25mm/s	
	6 s/mm = 0.16mm/s	
Supply voltage	24 Vac and 24 Vdc 230 Vac or 100-110 Vac by fitting power modules	
Control signal	24 to 230 V VMD, 0 - 10 Vdc and 4 - 20 mA (2-10 Vdc Split-Range unit accessory for 24 Vac/dc actuators only).	

2.2 Operation

Depending on the type of connection (see connection diagram), the actuator can be used as a continuous (0-10 V and/or 4-20 mA), 2-point (OPEN/CLOSE) or 3-point actuator (V.M.D.) (OPEN/STOP/CLOSE).
The running time of the actuator can be set with switches S1 and S2 according to the relevant requirements. Switches S3 and S4 are used to configure the characteristic (equal-percentage, linear or quadratic).

2.3 Manual operation

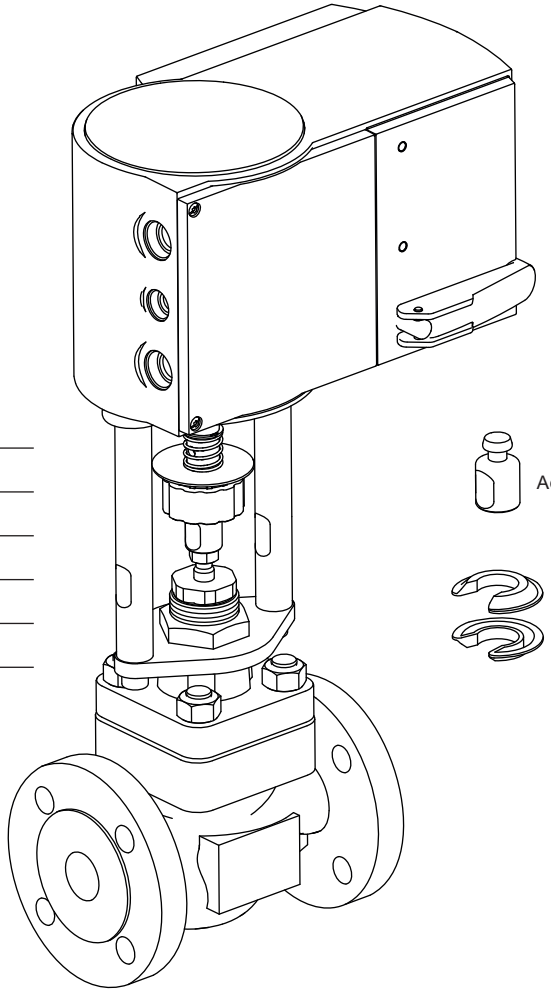
The external crank handle enables manual positional setting. When the crank handle is folded out, the motor is switched off. After the crank handle is folded back, the target position is approached again (without initialisation). When the crank handle is folded out, the actuator remains in this position. Handle needs to be rotated slowly to prevent damage to the actuator.

3. Installation

3.1 Location

The actuator should be mounted above the valve with sufficient space to remove the terminal cover and general ease of access. When selecting the location, make sure that the actuator is not exposed to an ambient temperature exceeding the range -10°C to + 55°C. Humidity <95%. The actuator is rated at IP66.

Warning
Prevent access by non technical personnel!



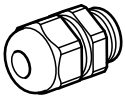
Items supplied loose

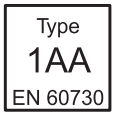
1 off M16 x 1.5 Gland nut
1 off M20 x 1.5 Gland nut
1 off adaptor
1 off warning label
2 off stroke indicator clips

Fig. 1

Warning label

M16 x 1.5 Gland nut
M20 x 1.5 Gland nut





Only actuators without accessories

Fig. 2

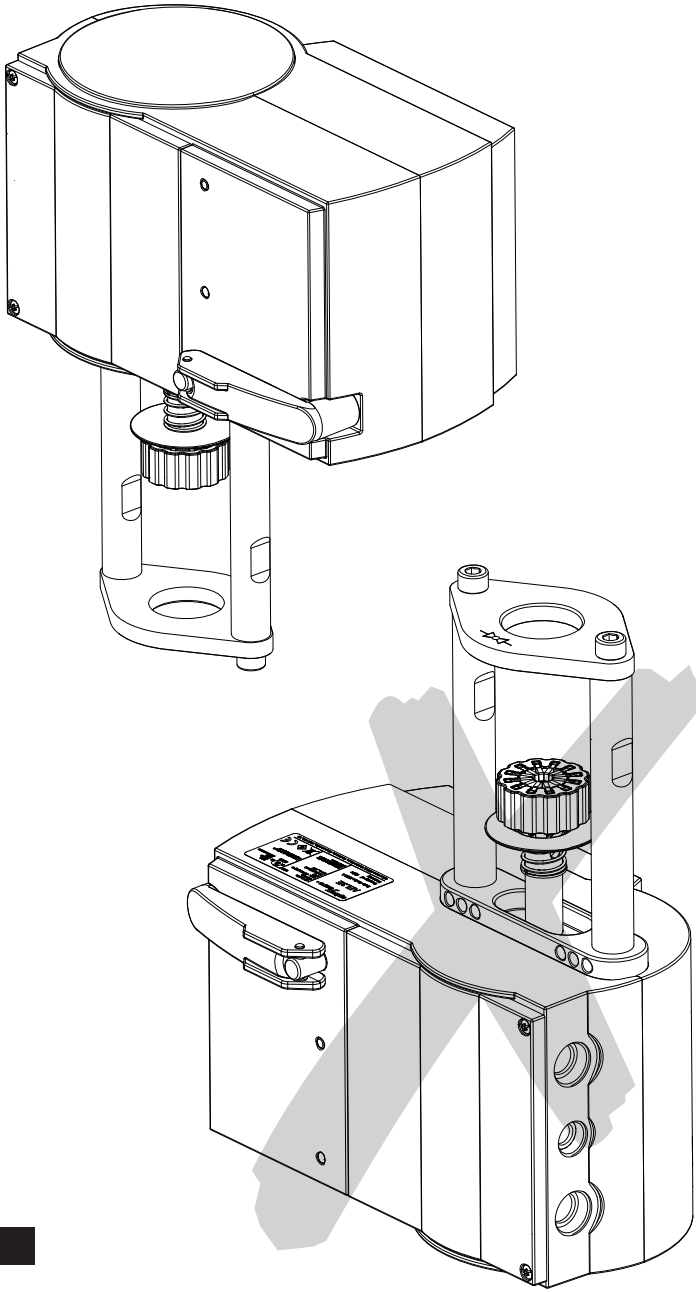


Fig. 3

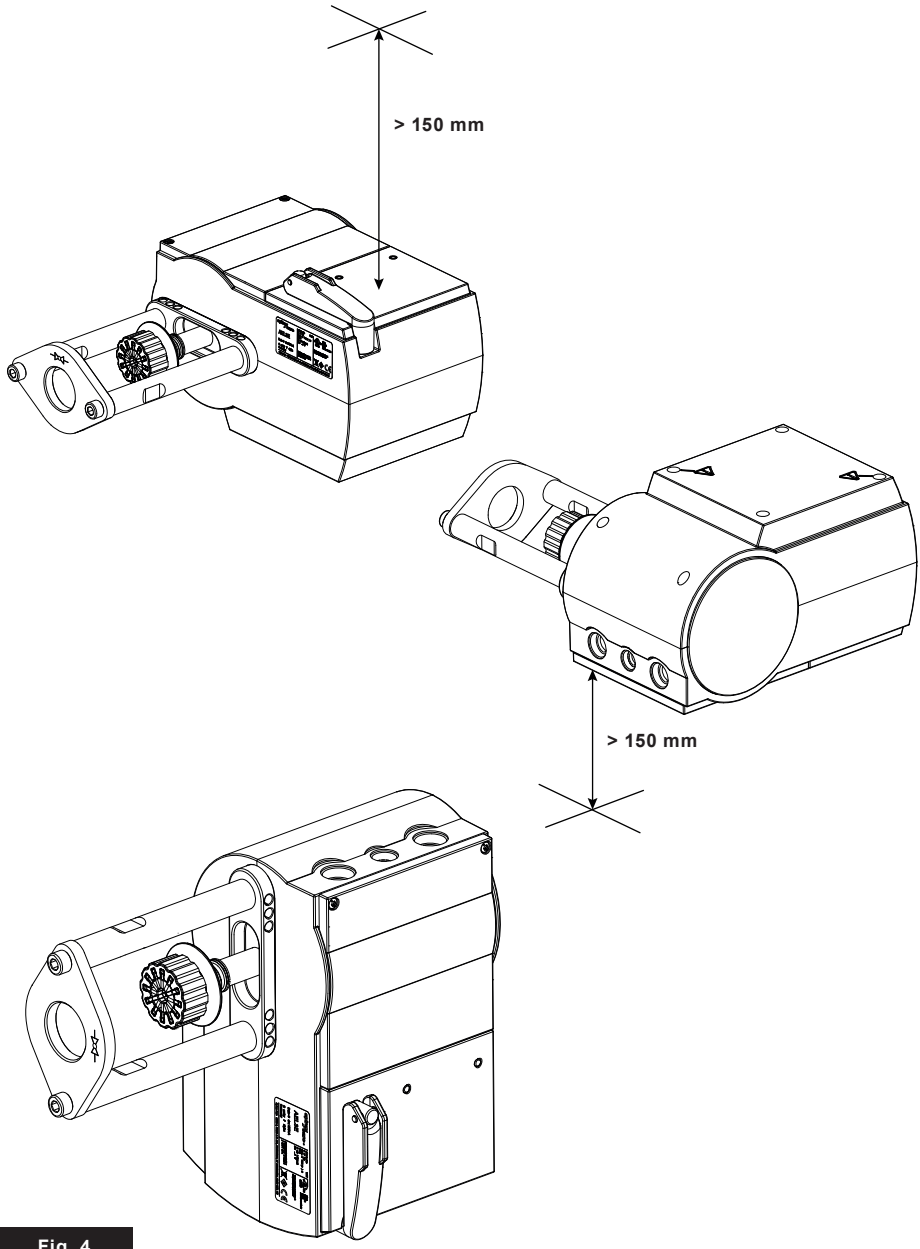
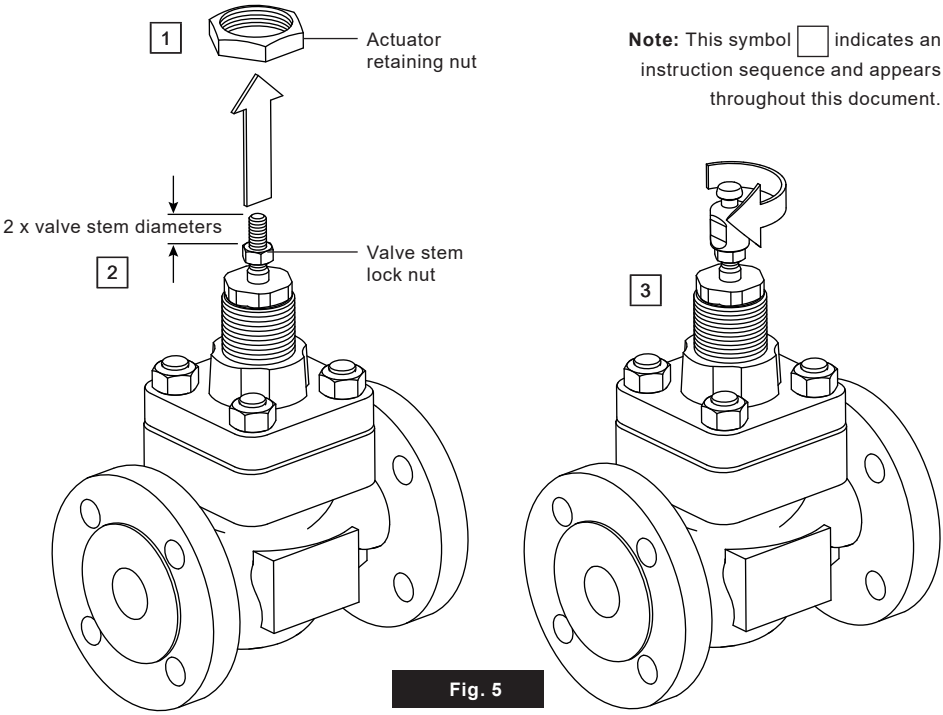


Fig. 4

3.2 Connecting the actuator to the valve

3.2.1 Mounting to 2-port Spira-trol valves

1. Remove the actuator retaining nut from the valve.
2. Screw the valve stem lock-nut 2 x valve stem diameters onto the valve stem
3. Screw the adaptor onto the stem and tighten the lock nut to secure it.



Note: This symbol ☐ indicates an instruction sequence and appears throughout this document.

Fig. 5

4. Pull clamp ring up until it is heard to click.

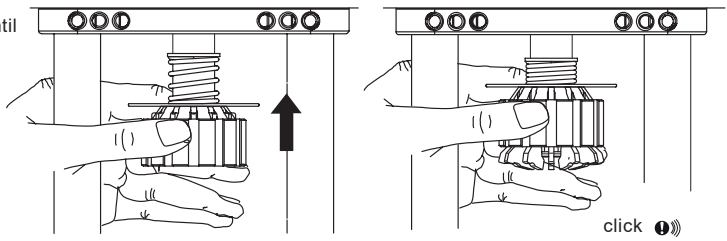


Fig. 6

5. Make sure that the spindle is fully retracted into the actuator and handle is up so that the spring is secured in place.

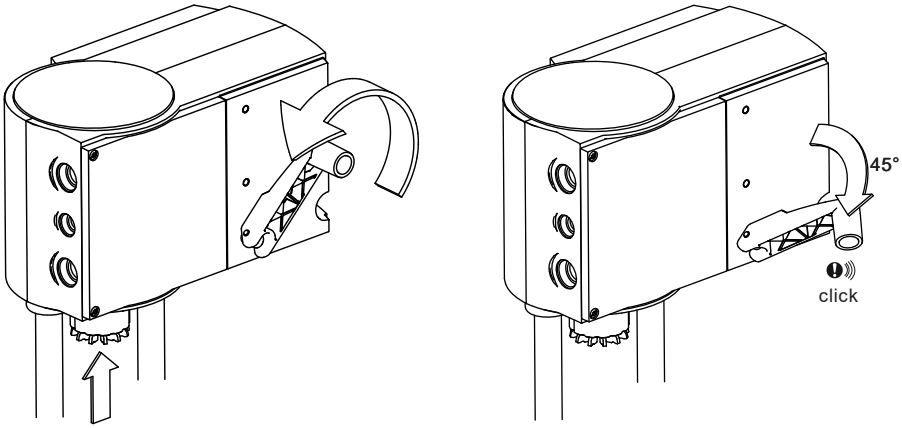


Fig. 7

6. Place the mounting flange and actuator over the valve bonnet thread.

7. Refit the actuator retaining nut and tighten (50 Nm for M34).

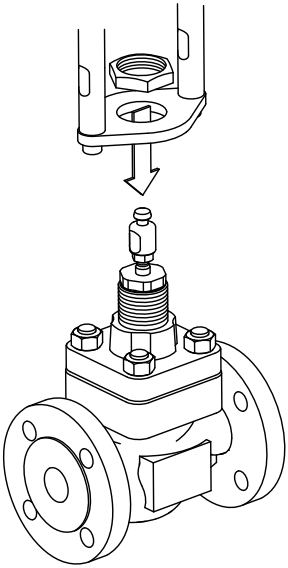


Fig. 8

Warning
Risk of injury due to limbs being trapped
• Avoid contact with the danger areas.

8. **For AEL3R and AEL3X -** use the handle to lower the actuator spindle until the clamp tightens over the adaptor.

   For AEL3E - fold the handle back to the home position in the actuator head and the spindle will lower automatically.

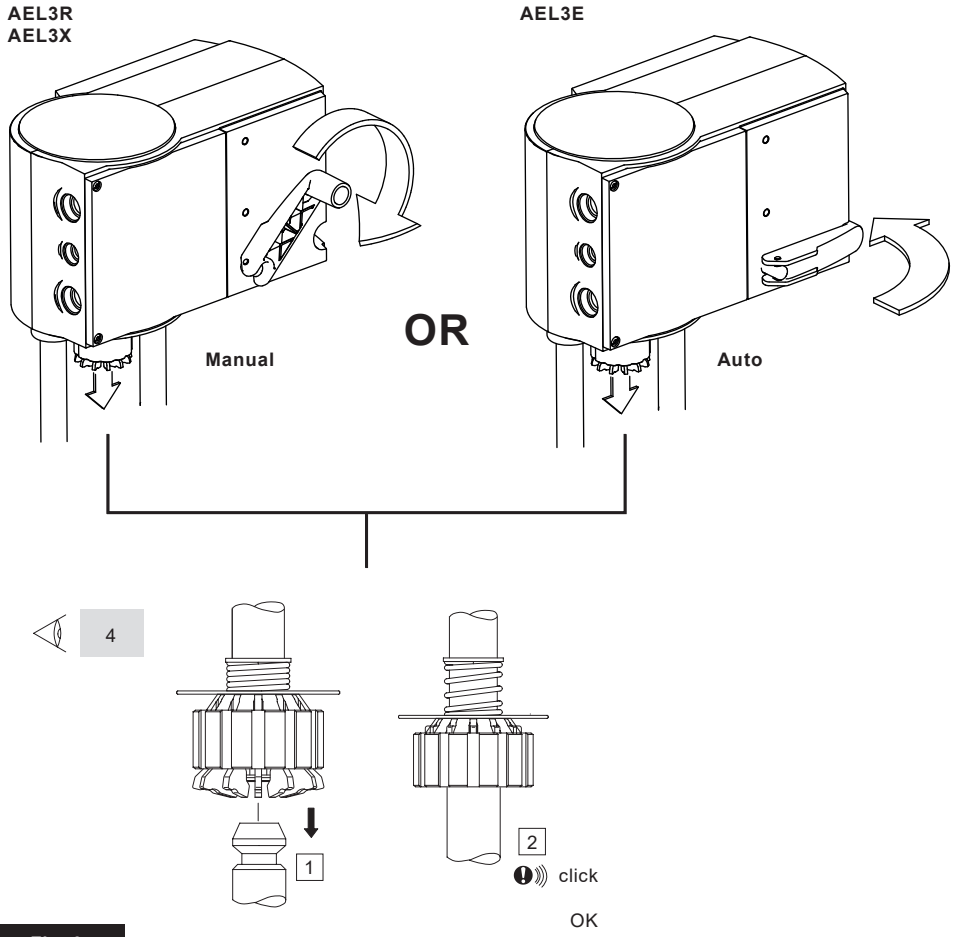


Fig. 9

9. Ensure handle is folded back against the actuator.

When mounting an actuator on a valve, never drive the actuator electrically, instead use the handle.

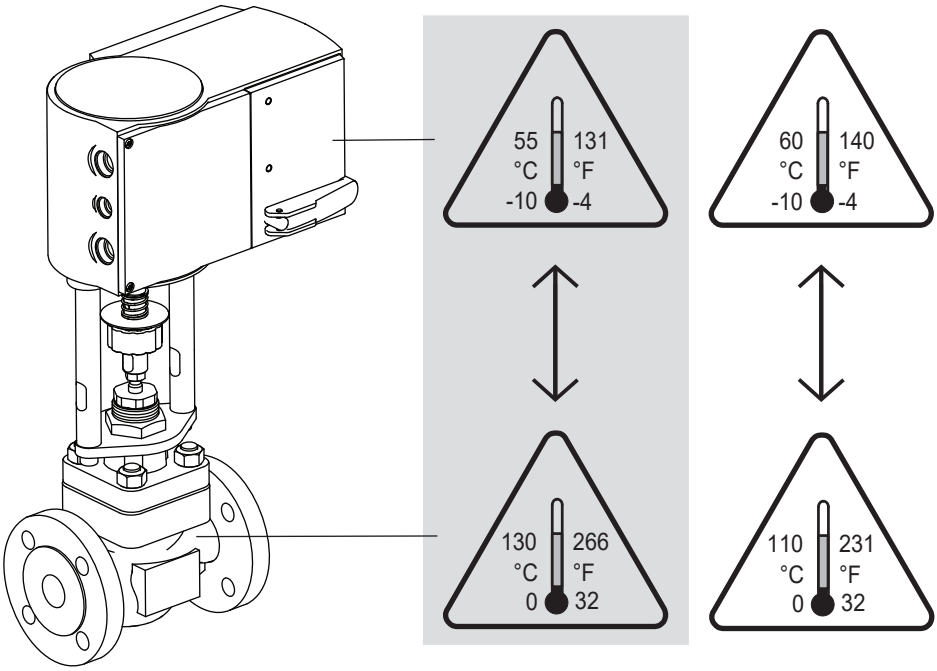


Fig. 10

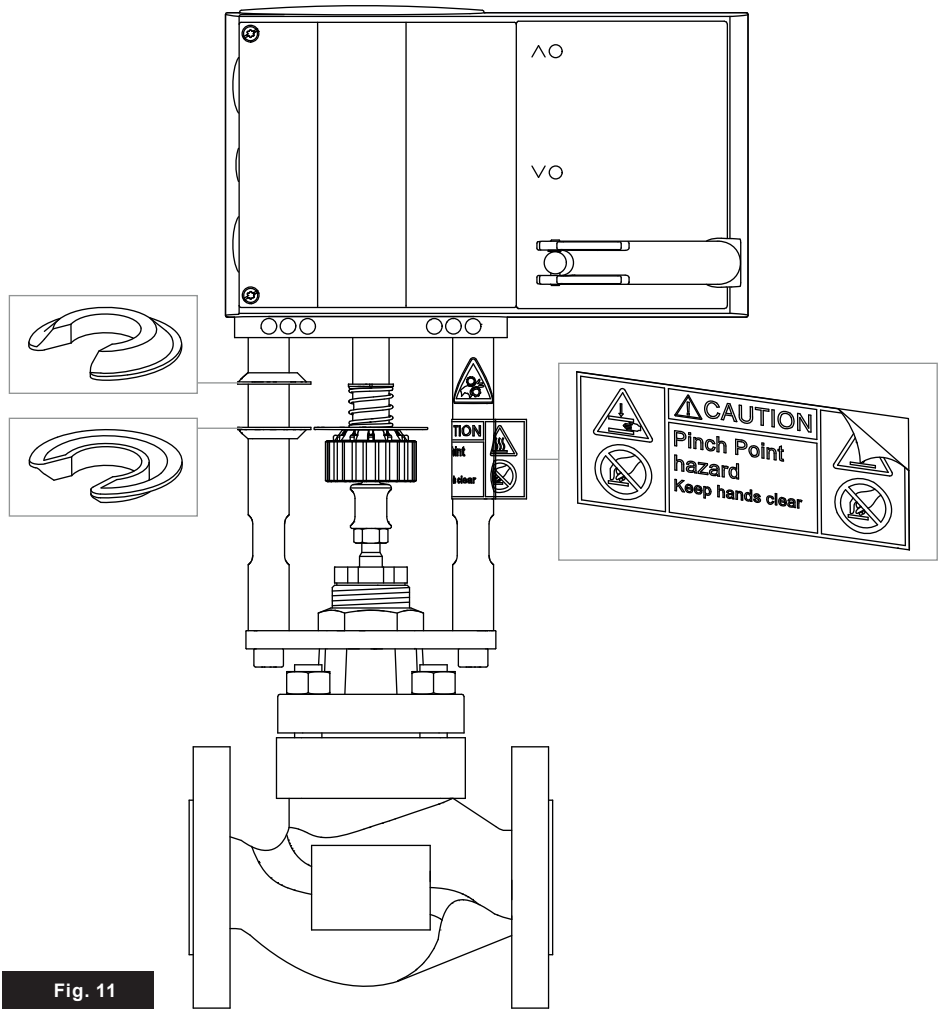


Fig. 11

3.2.2 Mounting to QL 3-way valves

1. Remove the actuator retaining nut from the valve.
2. Screw the valve stem lock-nut 2 x valve stem diameters onto the valve stem.
3. Make sure that the spindle is fully retracted into the actuator and handle is up so that the spring is secured in place.
4. Screw the coupling onto the stem and tighten the locking nut to secure it.
5. Ensure that the centering adaptor is on the bonnet thread (supplied with QL valve).
6. Place the mounting flange and actuator over the valve bonnet thread/centering adaptor.
7. Refit the actuator retaining nut and tighten (50 Nm for M30).
8. Pull clamp ring up until it is heard to click.
9. Using the handle lower the actuator stem until the clamp tightens over the adaptor.
10. Ensure handle is folded back against the actuator.

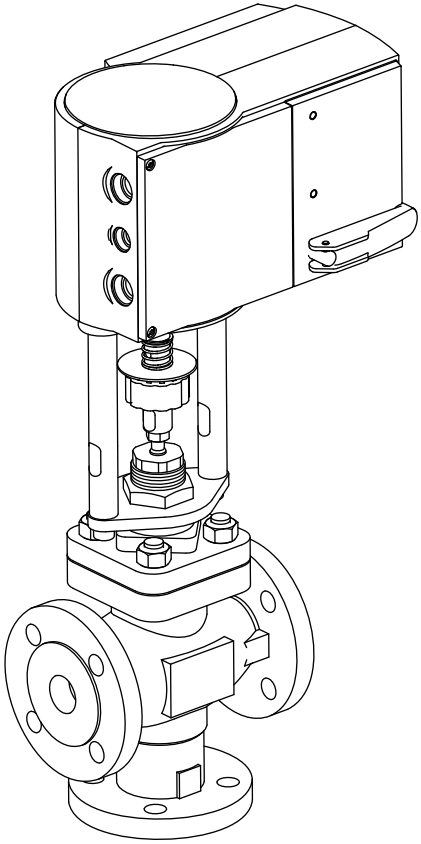


Fig. 12

3.3 Electrical connection

Warning
This is a class A equipment. It may cause radio interference in the home, in which case the operator may be requested to carry out appropriate measurement.

USA, Canada

Warning
This equipment is intended to be supplied by a „Power Source Class 2“. Allowed wire size: AWG 14-15. **All control signals and outputs are Class 2 AC/DC.**

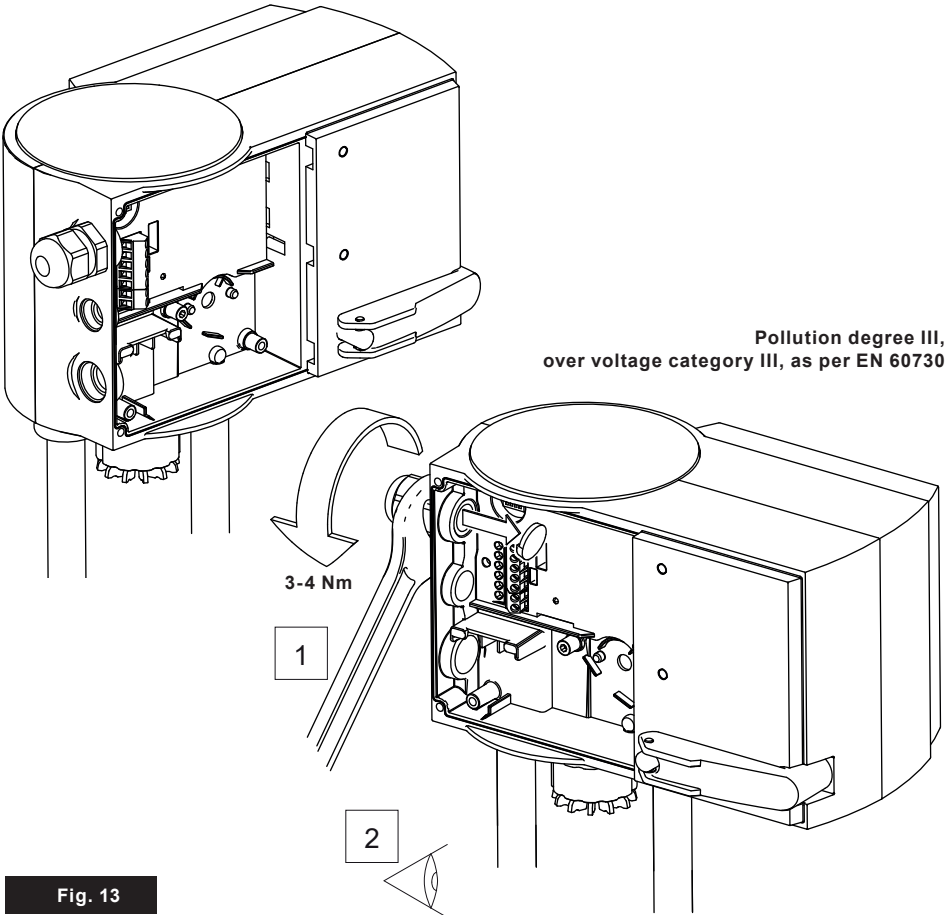


Fig. 13

Important

1. Read Section 1 'Safety information', before attempting to wire the supply to the actuator.
2. Slow blow fuses should be fitted in all phases, but not in the protective earth conductor.
3. The protective earth internal must be connected to the installation protective earth system. The integrity of the installation protective earth system must not be compromised by the disconnection or removal of other equipment.
4. For supply connections, use 1.5 mm² wire, double insulated as stated in IEC 60364 (or equivalent), if wires are exposed to touch.
5. Increase the wire section according to the length of the power line.
6. Dimension the safety transformer in the supply line correctly.
7. Inrush currents shall not conduct to a too big voltage drop.

3.3.1 Valve Motor Drive connection for 24V powered actuator

AEL3E/AEL3R

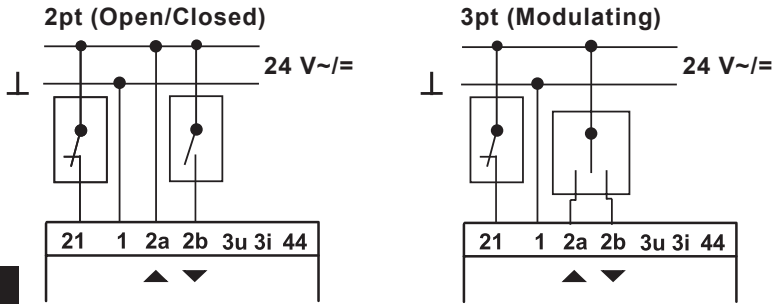


Fig. 14

AEL3X

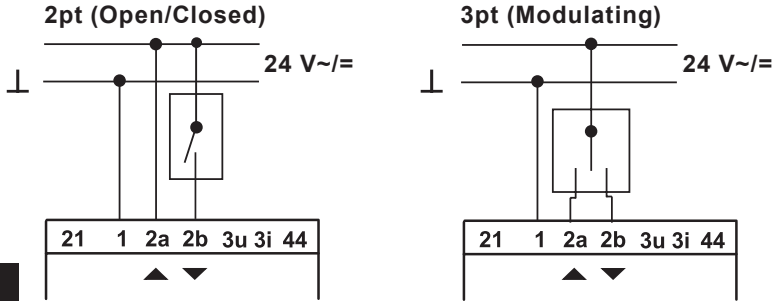


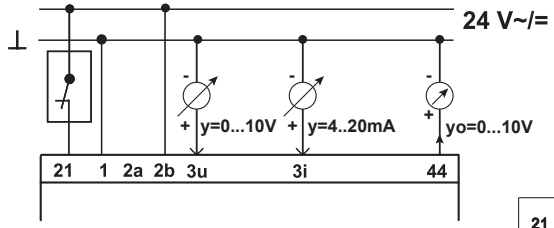
Fig. 15

3.3.2 Signal connection for 24 V powered actuator: 4-20 mA or 0-10 V

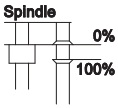
Connect the wiring as per the diagram.

Note: actuator action can be reversed via terminals 2a and 2b.

AEL3E/AEL3R



		3u	3i	44
2a	0%	0V	4mA	0V
	100%	10V	20mA	10V
2b	0%	10V	20mA	0V
	100%	0V	4mA	10V



		AEL3R	AEL3E
21		0%	100%
		2pt, 3pt, Cont.	

Fig. 16 **Signal to retract actuator**

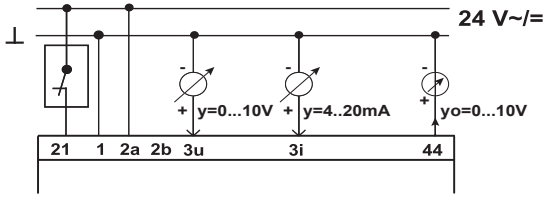
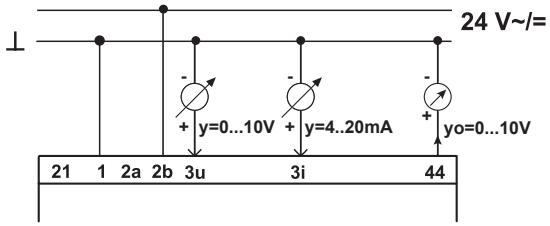


Fig. 17 **Signal to extend actuator**

AEL3X



		3u	3i	44
2a	0%	0V	4mA	0V
	100%	10V	20mA	10V
2b	0%	10V	20mA	0V
	100%	0V	4mA	10V

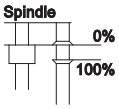


Fig. 18 **Signal to retract actuator**

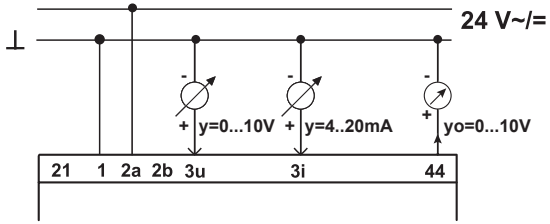


Fig. 19 **Signal to extend actuator**

3.3.3 Switch coding

Applies for continuous mode only

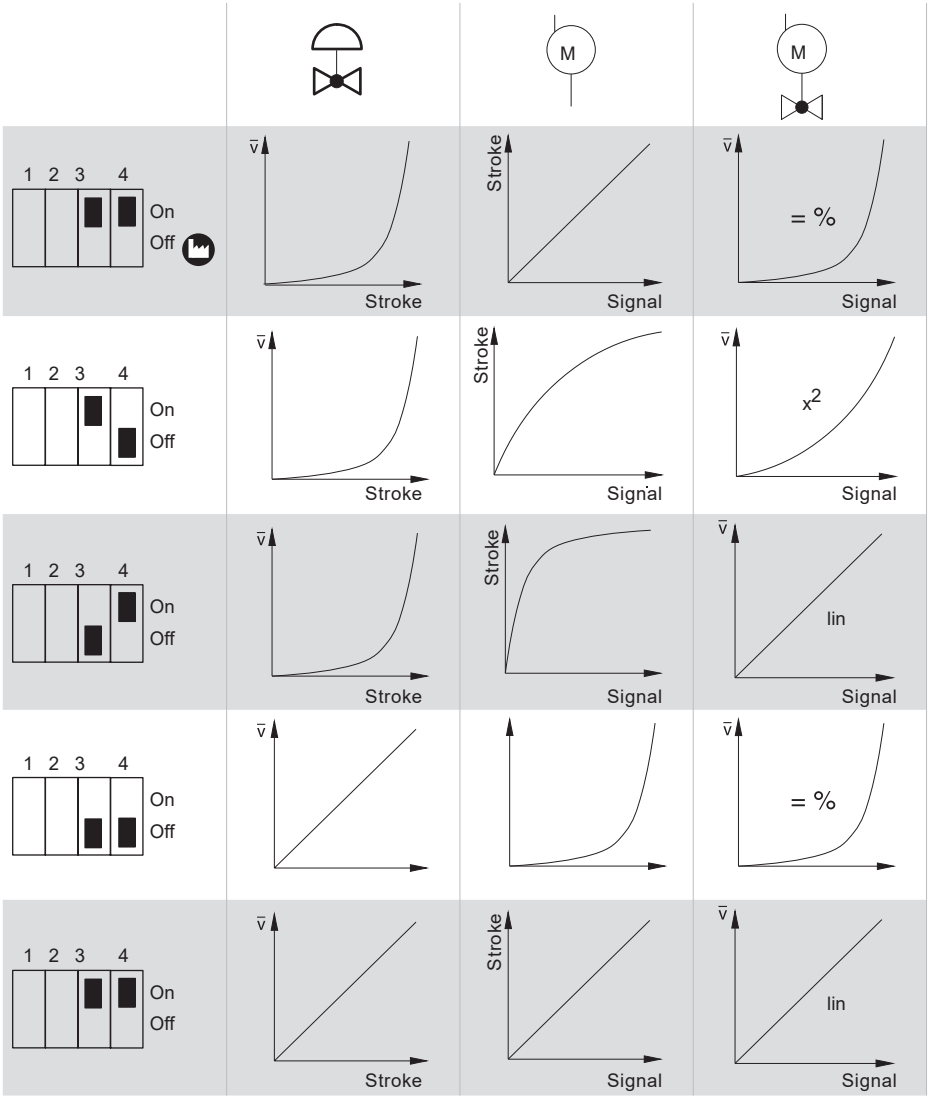


Fig. 20

	Stroke	1 mm	20 mm
1 2 3 4 On Off	Running time	2 s	40 s ± 1
1 2 3 4 On Off		4 s	80 s ± 4
1 2 3 4 On Off 1 2 3 4 On Off		6 s	120 s ± 4

Fig. 21

3.4 Initialisation

Automatic

When power is applied to the regulating unit for the first time, the automatic coupling with the valve and an initialisation take place. During this process, both LEDs on the drive flash in red.

1. The spindle extends until it reaches the mechanical stop on the regulating unit.
2. From this position, the spindle retracts until it reaches the mechanical stop on the regulating unit.
3. Initialisation is complete. The regulating unit moves to the position dictated by the control signal.

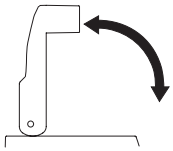


Fig. 22

Manual

If required, initialisation can always be triggered manually.

- Fold out and fold back the crank handle twice within 4 seconds (see diagram). Initialisation begins.
- The initialisation can be aborted by folding out the crank handle again.

3.5 LED functions

AEL3E and AEL3R	
LED	**Description**
Both LEDs flash red	Initialisation
Top LED lights up red	Top limit stop or "OPEN" position reached
Bottom LED lights up red	Bottom limit stop or "CLOSED" position reached
Top LED flashes green	Actuator is running, moving to "OPEN" position
Top LED lights up green	Actuator is stopped, last direction of travel "OPEN"
Bottom LED flashes green	Actuator is running, moving to "CLOSED" position
Bottom LED lights up green	Actuator is stopped, last direction of travel "CLOSED"
Both LEDs light up green	Wating time after switching on or after spring return
No LED lights up	No power supply (terminal 21)
Both LEDs flash red and green	Actuator is in manual mode

AEL3X	
LED	**Description**
Both LEDs flash red	Initialisation
Top LED lights up red	Top limit stop or "OPEN" position reached
Bottom LED lights up red	Bottom limit stop or "CLOSED" position reached
Top LED flashes green	Actuator is running, moving to "OPEN" position
Top LED lights up green	Actuator is stopped, last direction of travel "OPEN"
Bottom LED flashes green	Actuator is running, moving to "CLOSED" position
Bottom LED lights up green	Actuator is stopped, last direction of travel "CLOSED"
No LED lights up	No power supply (terminal 2a or 2b)
Both LEDs flash red and green	Actuator is in manual mode

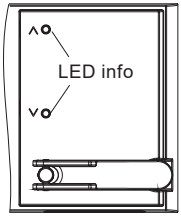


Fig. 23

Notice
This product should not be put into service until the machinery or system into which the product is due to be fitted, or of which it is intended to be a component, fulfils the relevant regulations and standards. Responsibility lies with the plant engineer or the installer.

3.6 Actuator removal

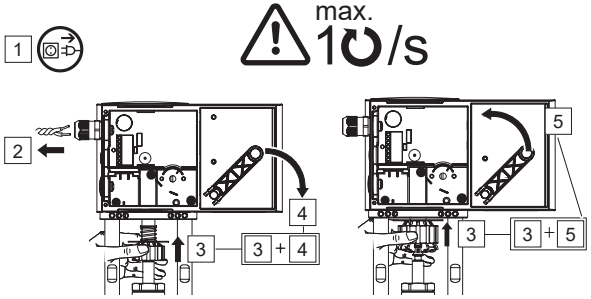


Fig. 24

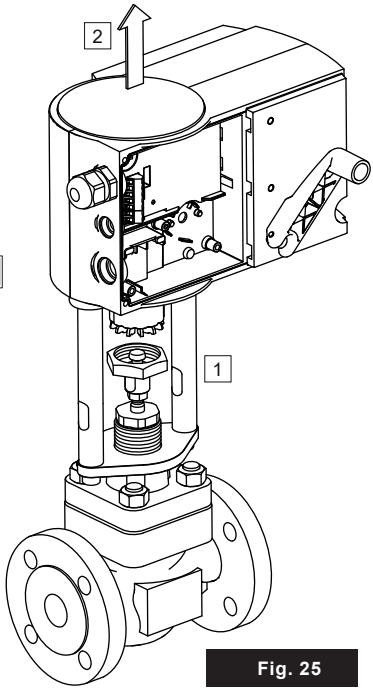


Fig. 25

Danger

Risk of hand injury caused by spring under tension.

- Do not dismantle the spring!

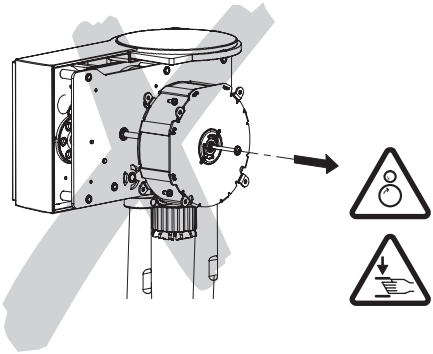


Fig. 26

3.7 100-110 V and 230 V power module installation

Note: Not compatible with Split-Range unit

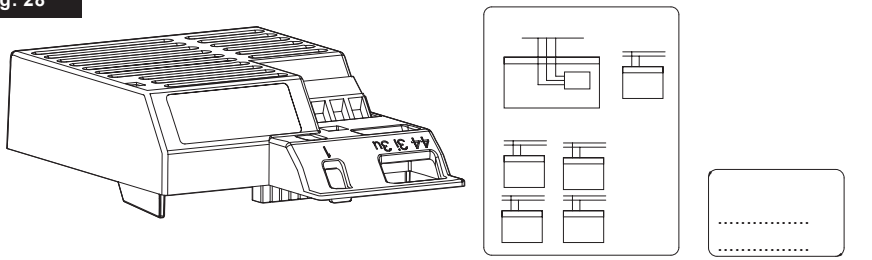
There are 2 additional options available for power supply: 100-110 V and 230 V. These are available by connecting an auxiliary power module to the standard actuator model. Fresh labels are provided that reflect the change made.

1. Open the actuator cover.
2. Slot in the appropriate power module in the space provided.
3. Replace/cover the original 24V wiring label on the inside of the actuator removable housing cover with fresh power module wiring label.
4. Use provided power module marking label and affix it on the existing label located on the underside of the actuator housing, so that it covers the existing portion of the label containing 24V and UL markings, as shown below.

Guidelines for the electrician

Fig. 27

Fig. 28



1x	3x	1x

Fig. 29

	T15
	3
	1

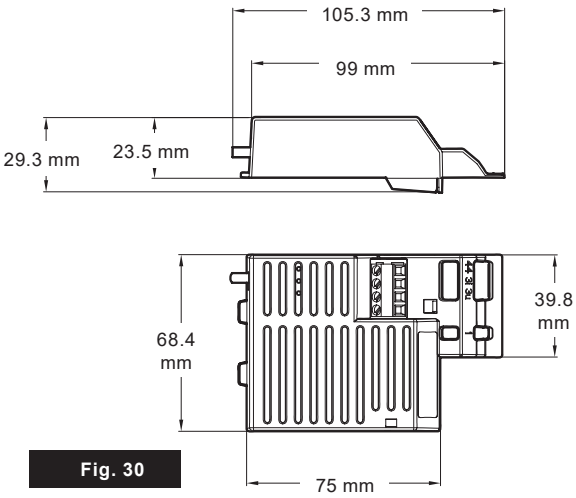


Fig. 30

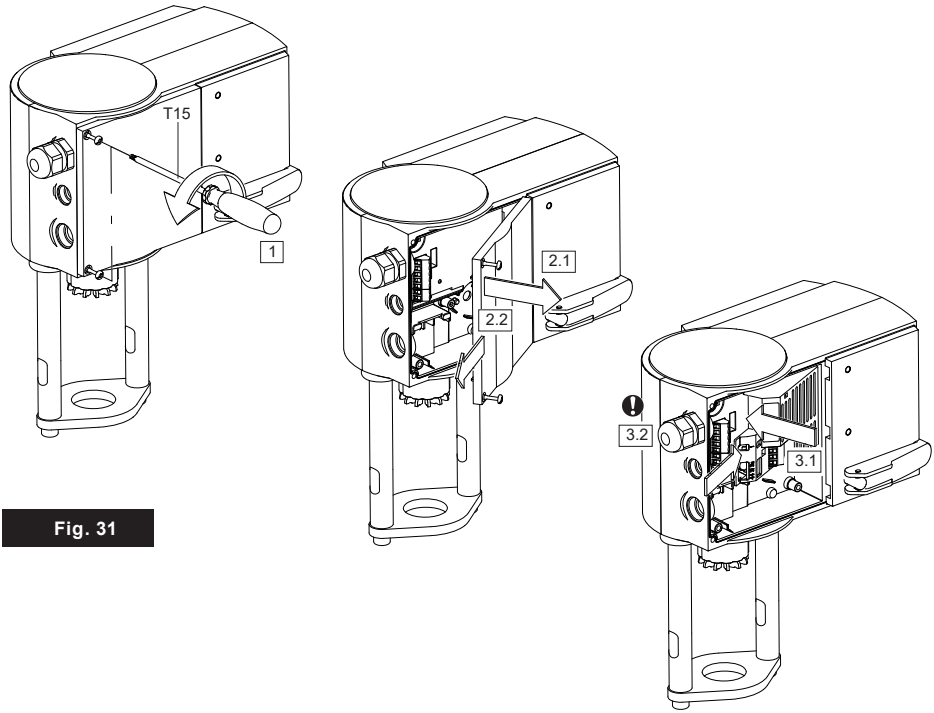
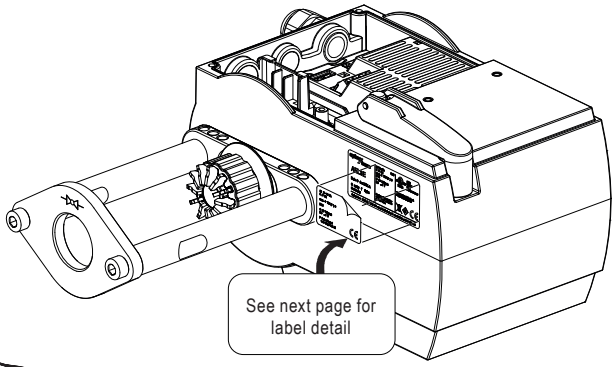


Fig. 31



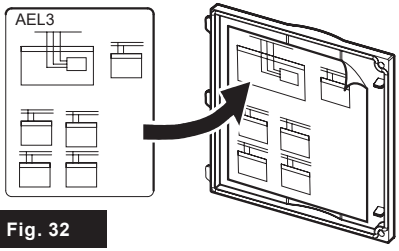


Fig. 32

Danger of electrocution

- Do not make a connection between terminal blocks X and Y.

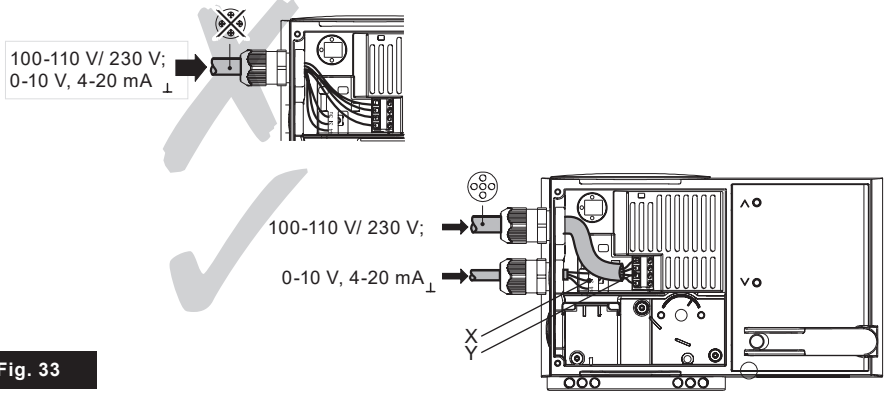
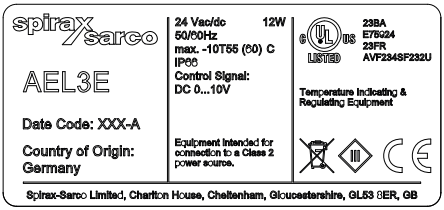
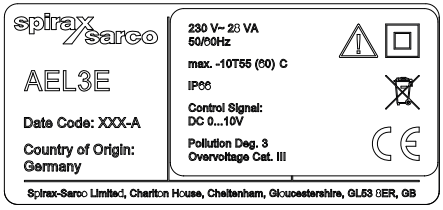


Fig. 33


spirax sarco
AEL3E
Date Code: XXX-A
Country of Origin:
Germany
24 Vac/dc 12W
50/60Hz
max. -10T55 (60) C
IP66
Control Signal:
DC 0...10V
Equipment intended for connection to a Class 2 power source.
c UL us LISTED
23BA
E75024
23FR
AVF234SF232U
Temperature Indicating & Regulating Equipment
III
Spirax-Sarco Limited, Chariton House, Cheltenham, Gloucestershire, GL53 8ER, GB


spirax sarco
AEL3E
Date Code: XXX-A
Country of Origin:
Germany
230 V~ 28 VA
50/60Hz
max. -10T55 (60) C
IP66
Control Signal:
DC 0...10V
Pollution Deg. 3
Overvoltage Cat. III
Spirax-Sarco Limited, Chariton House, Cheltenham, Gloucestershire, GL53 8ER, GB

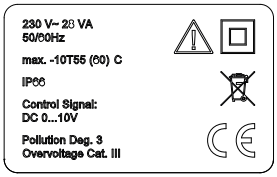
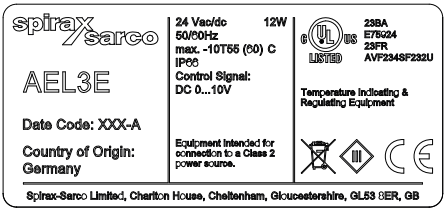
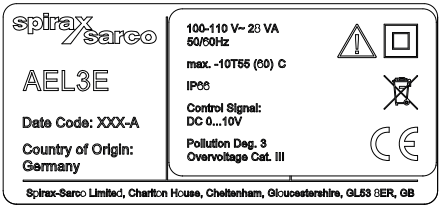

230 V~ 28 VA
50/60Hz
max. -10T55 (60) C
IP66
Control Signal:
DC 0...10V
Pollution Deg. 3
Overvoltage Cat. III

Fig. 34


spirax sarco
AEL3E
Date Code: XXX-A
Country of Origin:
Germany
24 Vac/dc 12W
50/60Hz
max. -10T55 (60) C
IP66
Control Signal:
DC 0...10V
Equipment intended for connection to a Class 2 power source.
c UL us LISTED
23BA
E75024
23FR
AVF234SF232U
Temperature Indicating & Regulating Equipment
III
Spirax-Sarco Limited, Chariton House, Cheltenham, Gloucestershire, GL53 8ER, GB


spirax sarco
AEL3E
Date Code: XXX-A
Country of Origin:
Germany
100-110 V~ 28 VA
50/60Hz
max. -10T55 (60) C
IP66
Control Signal:
DC 0...10V
Pollution Deg. 3
Overvoltage Cat. III
Spirax-Sarco Limited, Chariton House, Cheltenham, Gloucestershire, GL53 8ER, GB

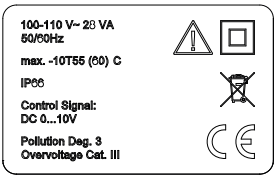

100-110 V~ 28 VA
50/60Hz
max. -10T55 (60) C
IP66
Control Signal:
DC 0...10V
Pollution Deg. 3
Overvoltage Cat. III

Fig. 35

3.7.1 Valve Motor Drive connection for actuators fitted with power module

AEL3E/AEL3R

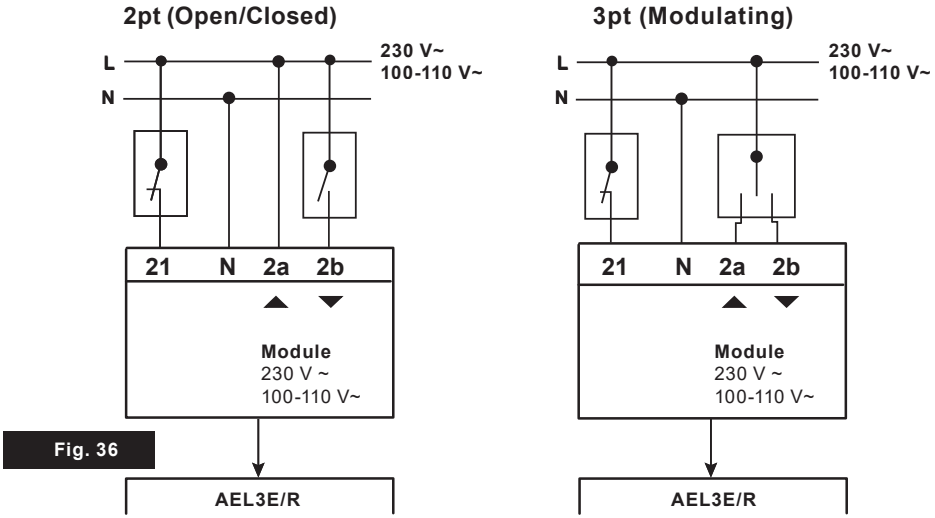


Fig. 36

AEL3X

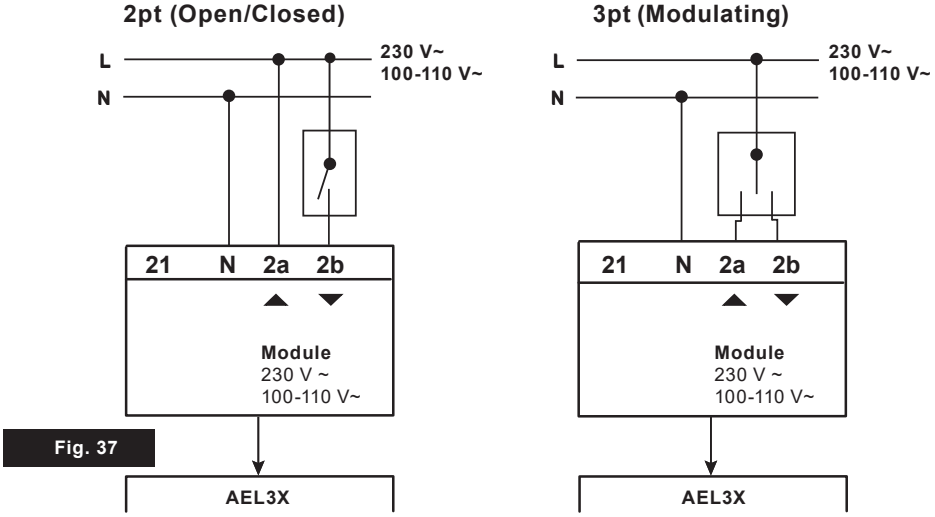


Fig. 37

3.7.2 Signal connection for actuators fitted with a power module: 4-20 mA or 0-10 V

Note: Actuator action can be reversed via terminals 2a and 2b.

AEL3E/AEL3R

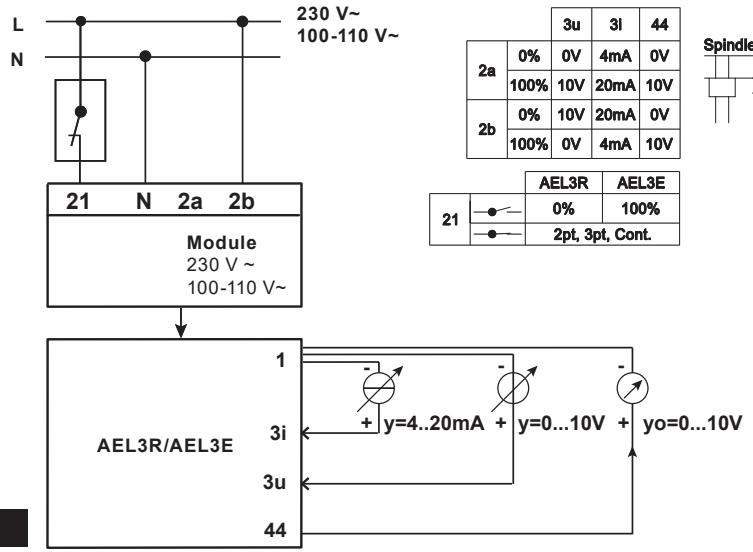


Fig. 38

Signal to retract actuator

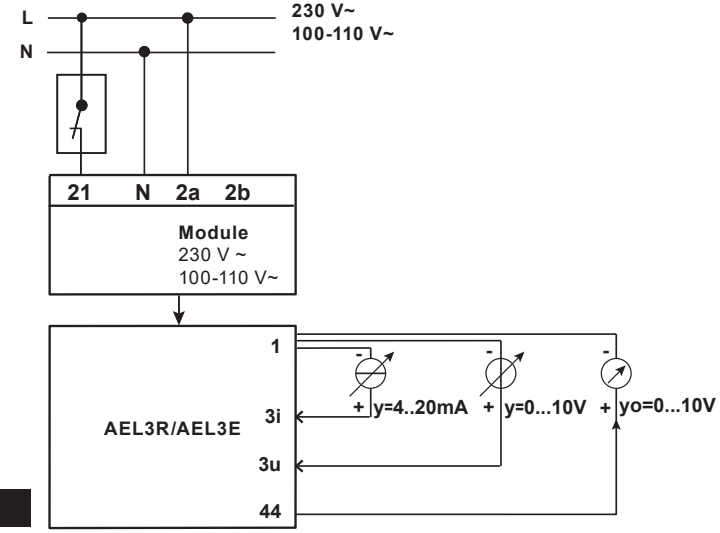
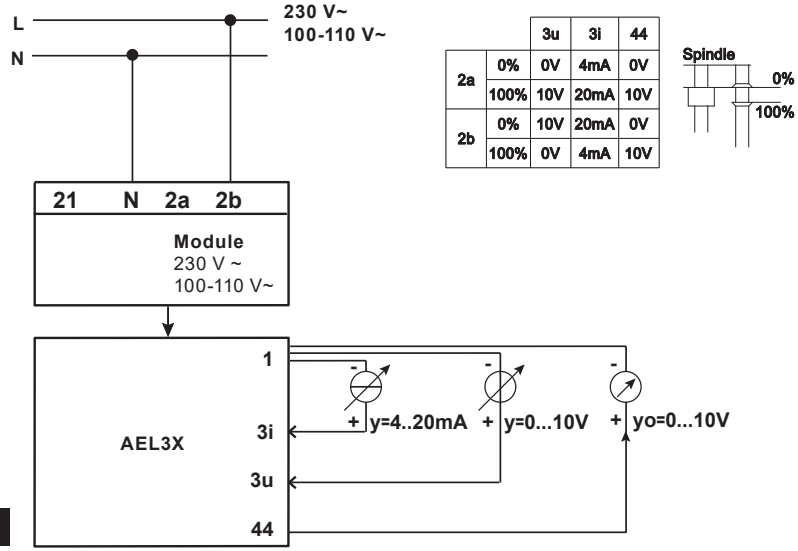


Fig. 39

Signal to extend actuator

AEL3X



		3u	3i	44
2a	0%	0V	4mA	0V
	100%	10V	20mA	10V
2b	0%	10V	20mA	0V
	100%	0V	4mA	10V

Fig. 40

Signal to retract actuator

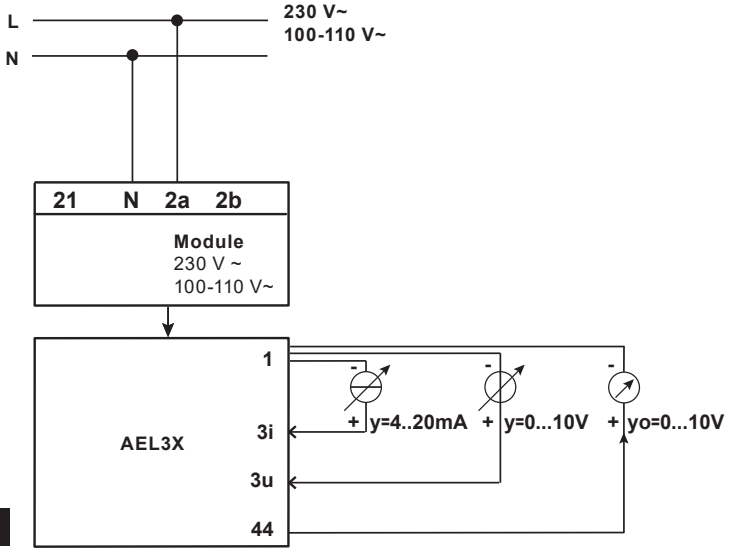


Fig. 41

Signal to extend actuator

3.8 Removing the power module

1. Ensure actuator is disconnected from power supply.
2. Remove all wiring from the terminals.
3. Insert a flathead screwdriver in the slot as shown in the diagram.
4. Depress the screwdriver and push it gently to the right to unlock the latch. Be careful not to break it off.
5. While applying gentle pressure on the latch, pry the power module away from the actuator.

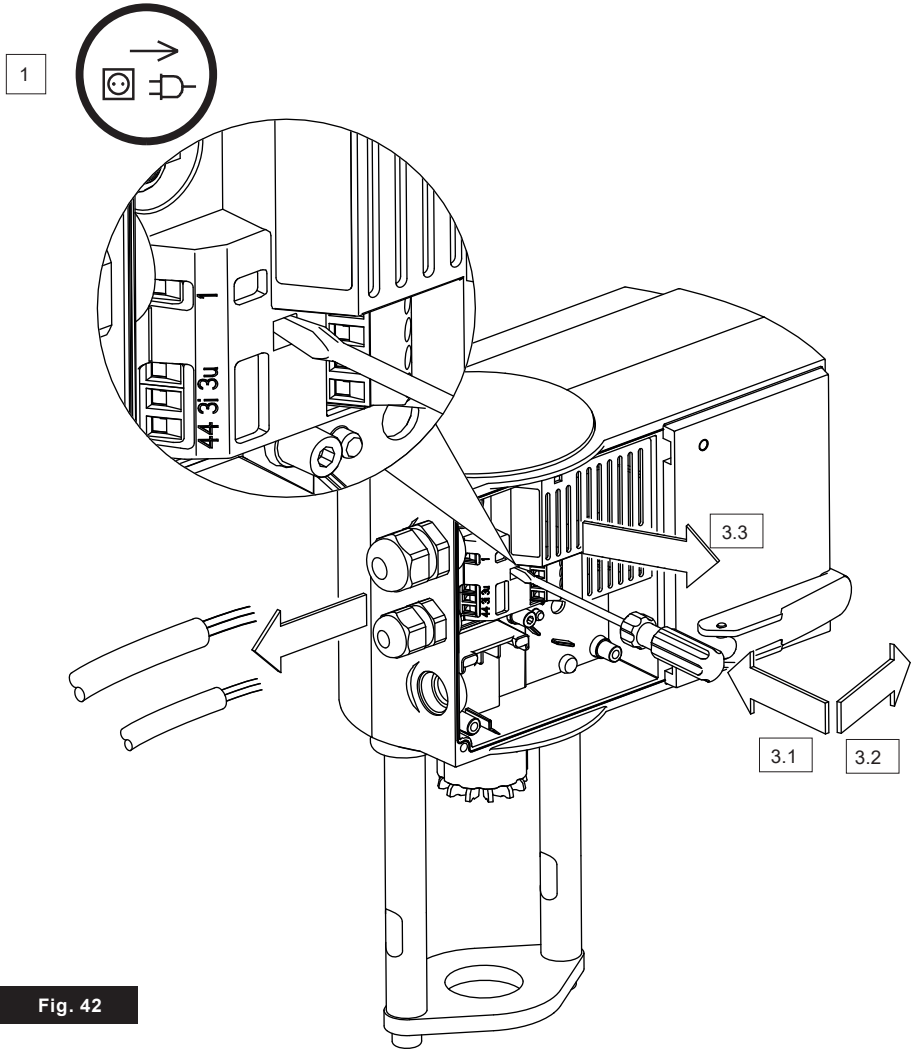


Fig. 42

3.9 Installing the auxiliary switches

For use in normal environments

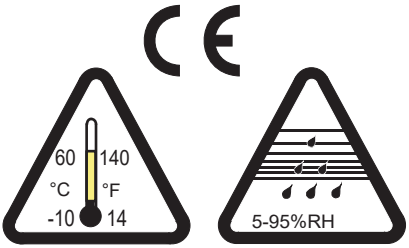


Fig. 43

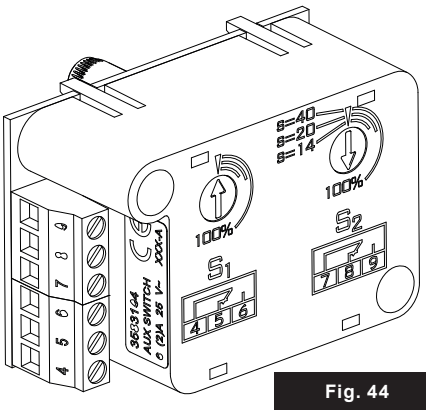


Fig. 44

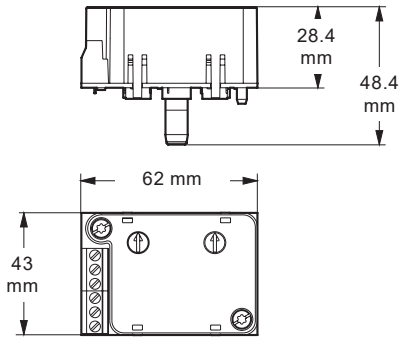


Fig. 45

	T15
	1
	3
	s24 (1×)

Fig. 46

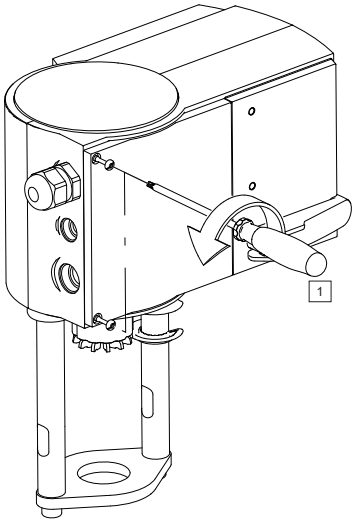


Fig. 47

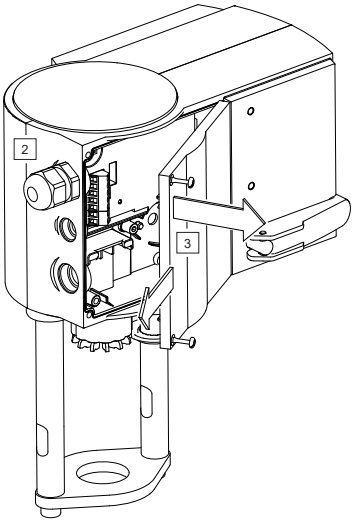


Fig. 48

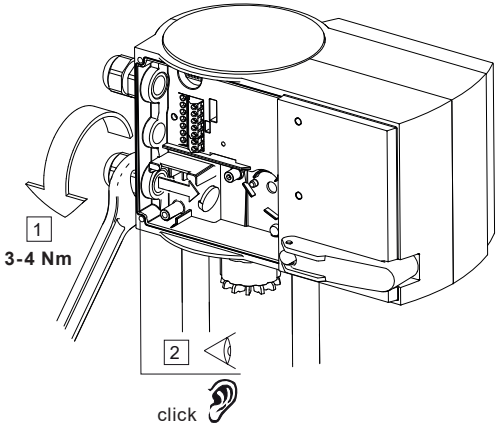


Fig. 49

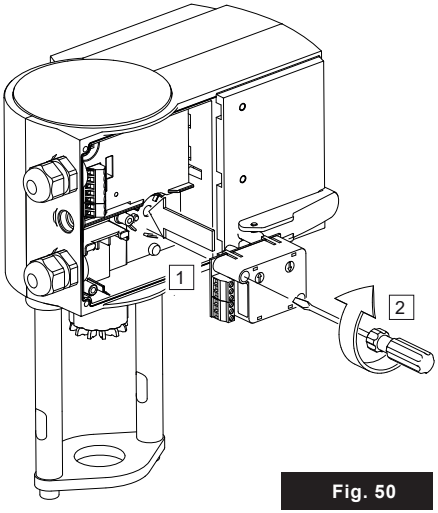


Fig. 50

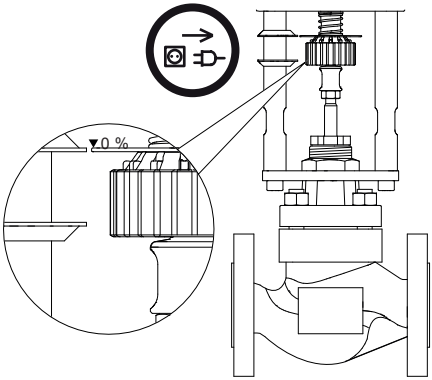


Fig. 51a

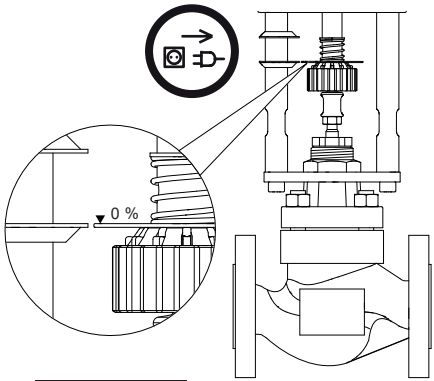
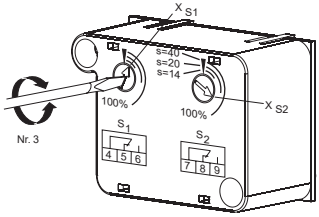


Fig. 52a



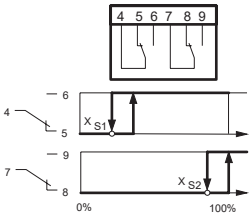


Fig. 51b

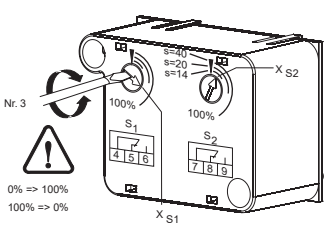


Fig. 52b

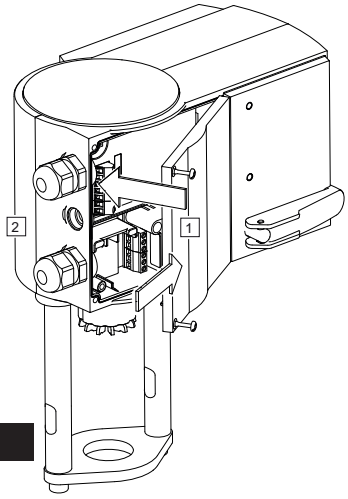


Fig. 53

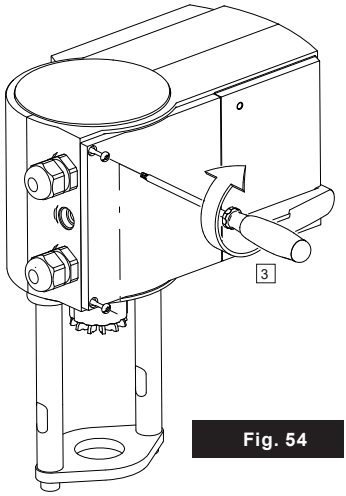
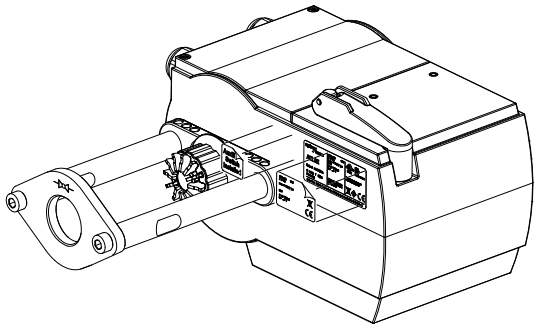
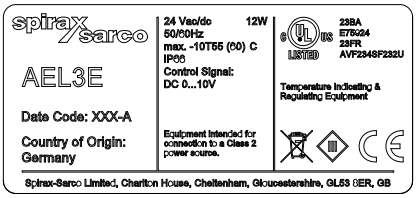
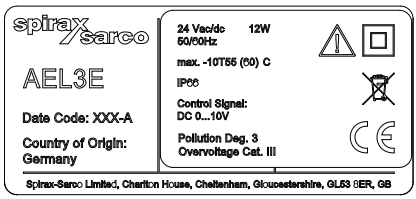


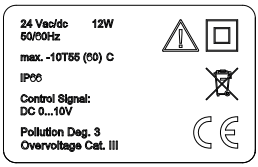
Fig. 54

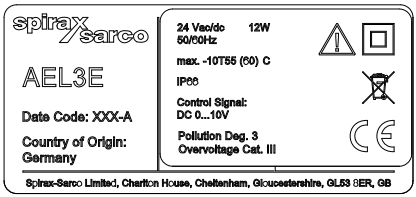


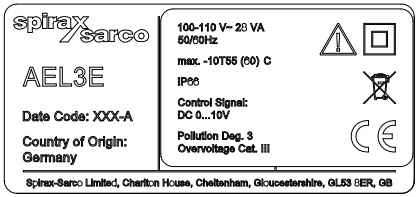




Note: Overlay label also required for 24V variant as auxiliary switch is not UL approved.







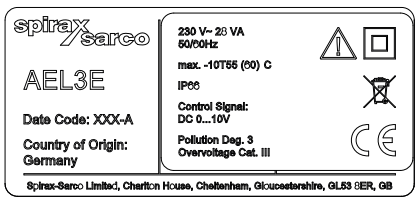


Fig. 55

3.10 High temperature extension kit

The extension kit is to be used on applications above 130 °C to up to 240 °C. There are two kit options of up to 180 °C and another for up to 240 °C

1. Unscrew the actuator mounting plate screws for pillars.
2. Screw the extension pillars into actuator pillars and tighten to 12 Nm.
3. Screw the actuator mounting plate screws into pillars and tighten to 25 Nm.
4. Mount the coupling extension into the actuator coupling until it snaps closed.

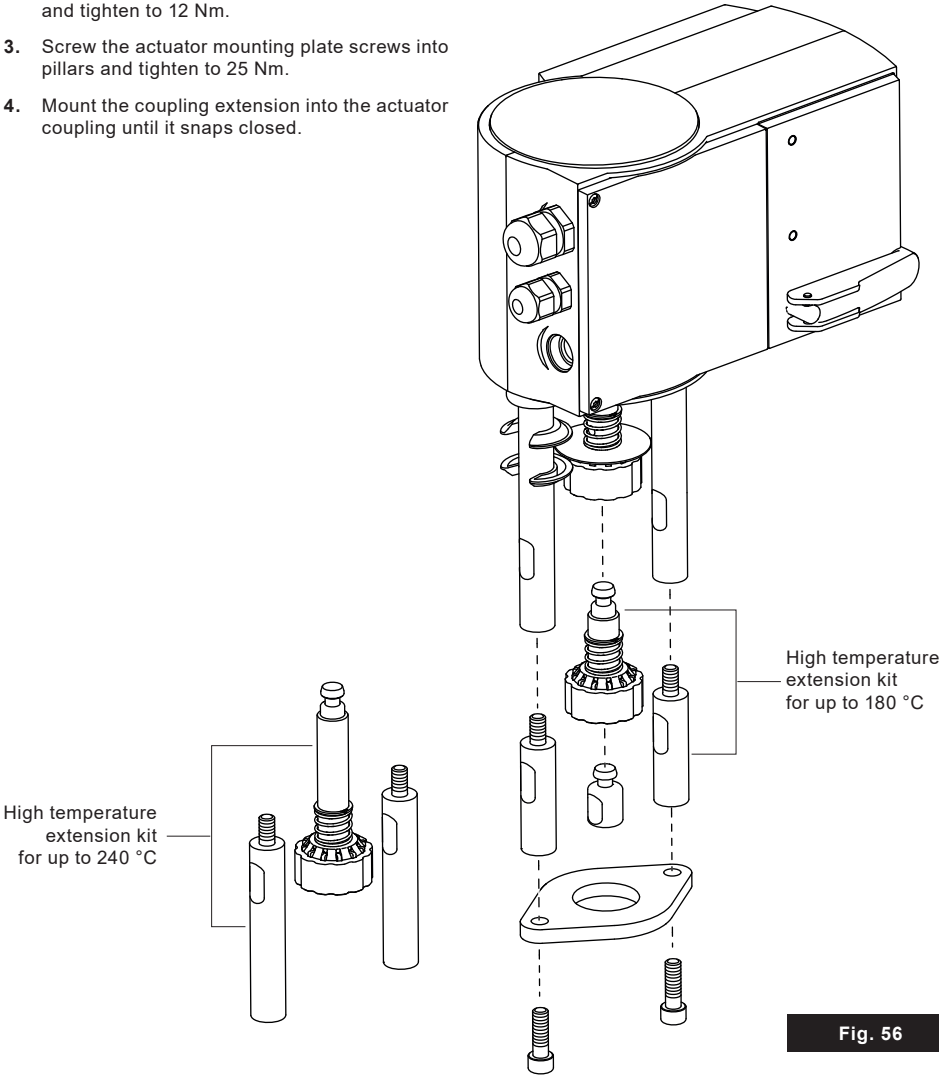
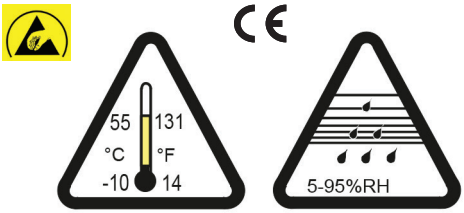


Fig. 56

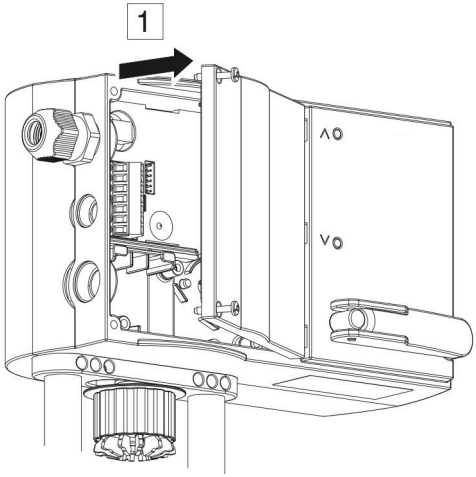
3.11 2-10 Vdc Split-Range unit installation

Installing the Split-Range Unit

Note:
Not compatible with Power Modules



For use in normal environments



(1 x) K35 x 20/10

T15 / 3

Fig. 57

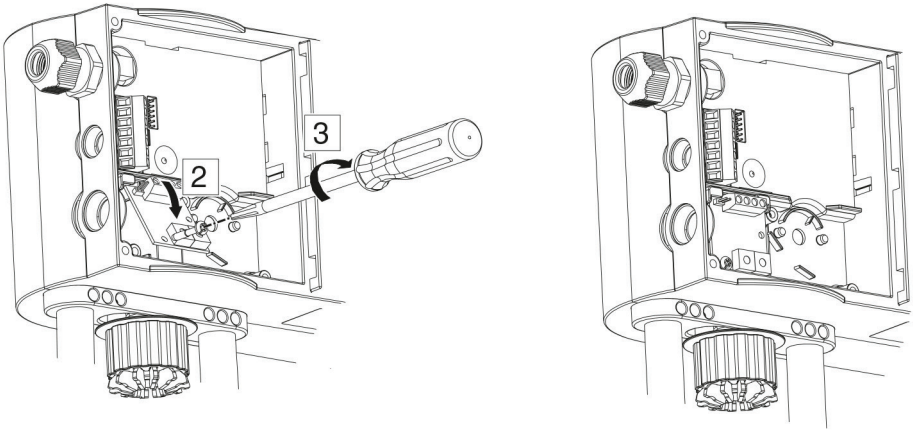


Fig. 58

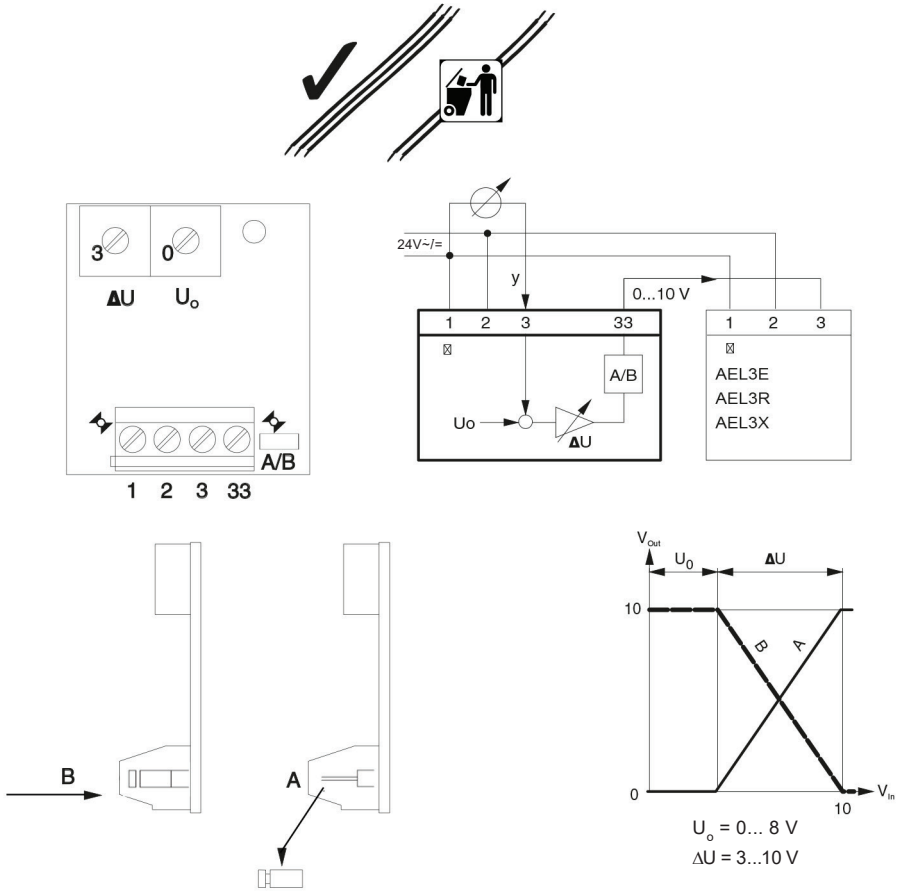
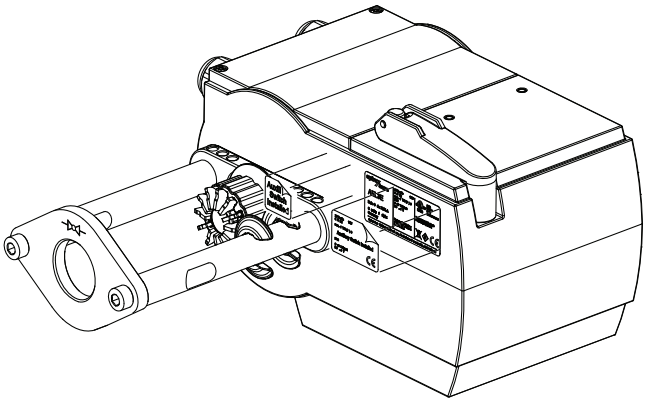
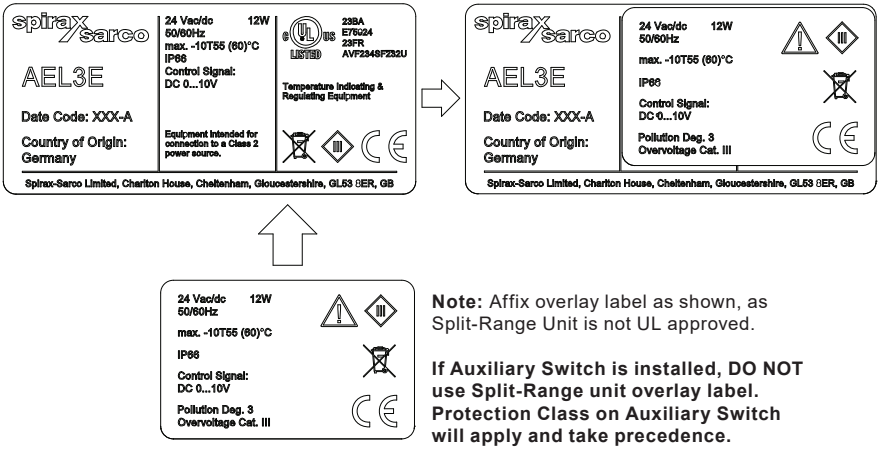

3
0
ΔU
Uo
A/B
1 2 3 33
24V~/=
y
0...10 V
1 2 3 33
A/B
Uo
ΔU
1 2 3
AEL3E
AEL3R
AEL3X
B
A
VOut
U0
ΔU
10
0
VIn
10
Uo = 0... 8 V
ΔU = 3...10 V

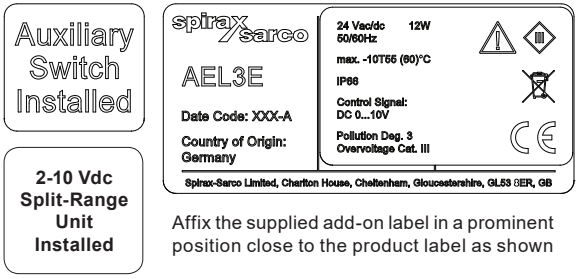
Fig. 59





Note: Affix overlay label as shown, as Split-Range Unit is not UL approved.

If Auxiliary Switch is installed, DO NOT use Split-Range unit overlay label. Protection Class on Auxiliary Switch will apply and take precedence.



Affix the supplied add-on label in a prominent position close to the product label as shown

Note: Auxiliary Switch Installed label shown, may or may not be installed and is shown for Split Range unit label positioning only.

Fig. 60

4. Commissioning

Actuators supplied already fitted to control valves would be supplied already commissioned. However, should it be necessary to commission an actuator, the following procedure should be adopted.

4.1 Preliminary checks - All actuators

1. Check that the actuator voltage corresponds to that required.
2. Ensure the wiring corresponds to that outlined in Section 3.3, 3.7 or 3.11.
3. Ensure the assembly of the valve and actuator has been carried out according to the instructions in Section 3.2.

5. Maintenance

Always make sure that the electrical supply is switched off when carrying out maintenance on the actuator or valve.

There are no maintainable parts within the actuator.

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