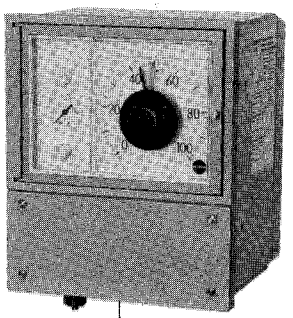
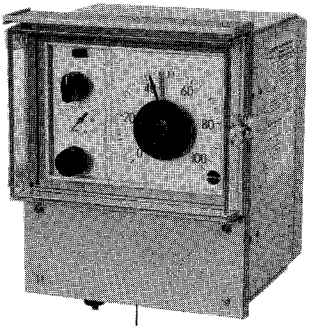
Series 430
Pneumatic Controller for Pressure

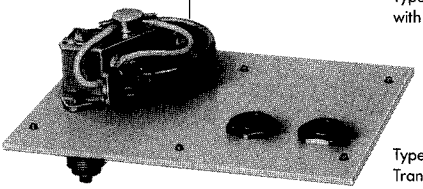
Controller Station Type 3432
Transmitter Module Type 3435





Type 3432-01 Controller station

Type 3432-02 Controller station with manual/automatic change-over



Type 3435 Transmitter module

Fig. 1 · Controller stations

1. Application

The pneumatic controller is used for pressure control in industrial and process plants for liquid, gaseous, and vaporous media. The controller directly measures the medium pressure, indicates the operating value, compares the measured value with the set point, and provides a pneumatic output signal of 0.2...1 bar or 3...15 psi. Depending on its construction, the indicating controller can be used as fixed set point controller, as follower controller or as fixed set point and follower controller.

Edition February 1993

Mounting and operating instruction

EB 7032 E

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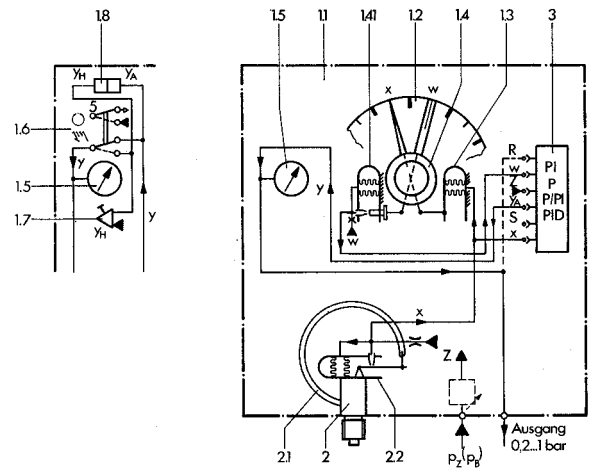
2. Construction

Basically, the controller consists of the Type 3432 controller station, a Type 3433 or 3434 controller module, and the Type 3435 transmitter module having eight different measuring ranges from 0...1.6 bar to 0...40 bar. For special control tasks, the Type 3433 controller module can be combined with a Type 3437 additional module (see EB 7040). If required, the controller station can be equipped with a manual/automatic change-over unit consisting of a selector switch, an adjuster for manual operation, and a differential pressure display.

When used as combined fixed set point or follower controller, the controller station is equipped with an additional unit for change-over w_{int}/w_{ext}. When used as follower controller it is provided with an additional input for the external command variable w_{ext} (e.g. 4 (0)...20 mA).

Furthermore, 1 or 2 inductive limit switches, which are adjustable at the scale, can be mounted to the gear mechanism on option.



1 Controller station
1.1 Housing with door
1.2 Scale
1.3 Controlled variable display with pointer, gear mechanism, and bellows measuring system
1.4 Set point adjuster with pointer, gear mechanism, and set point transmitter (1.41); with follower controllers set point display only
1.5 Output signal display
1.6 Manual/automatic switch
1.7 Adjuster for manual operation
1.8 Differential pressure display for bumpless manual/automatic change-over
1.9 Supply pressure regulator

2 Transmitter module for pressure
2.1 Bourdon tube
2.2 Pneumatic servo-control system

3 Controller module

Fig. 2 · Controller station with transmitter module (left: detail with manual/automatic-switch)

3. Principle of operation

3.1 Transmitter module

The pressure p of the measured medium is fed to the transmitter module (2) where it causes a deflection at the bourdon tube measuring system (2.1). Subsequently, the servo-control system (2.2) converts this deflection into a pneumatic actual value signal (controlled variable x) proportional to the pressure p. This signal is fed to the bellows measuring system of the controlled variable display (1.3) as well as to the controller module (3).

3.2 Controller station

The controlled variable signal x causes a deflection in the bellows measuring system of the controlled variable display (1.3). This deflection is transmitted to the pointer via a gear mechanism. The set point (command variable w) can be adjusted at the scale (1.2) from the front. The position of the set point adjuster (1.4) is transmitted to the set point transmitter via a gear mechanism. This servo-control system (1.41) converts the adjusted set point into a pneumatic set point signal (w) which is supplied to the controller module. The controller module compares the controlled variable signal and the set point signal (x and w) and provides an output signal y_A as a function of the system deviation and the adjusted control parameters. The controller output signal is connected to the output signal display (1.5) and the output y.

The controller station with manual/automatic change-over (Fig. 2, detailed view) is additionally provided with a manual/automatic-switch (1.6), an adjuster for manual operation (1.7), and a differential pressure display (1.8). When the switch is set to "Automatic", the output signal display (1.5) and the output y are supplied with the automatic-output signal Y_A. When the switch is set to "Manual", they are

supplied with the manual-output signal Y_H, which is adjusted at the adjuster (1.7). Bumpless change-over from manual to automatic operation is possible when the differential pressure display indicates that Y_A and Y_H are identical.

3.3 Controller modules

The controller modules are plug-in units. They are slid into the self-sealing connectors of the controller station and secured with a screw.

3.3.1 Type 3433 Controller modules

The controller modules consist of the comparator, which is provided with four metal bellows arranged in a square, and the base plate with the plug-in connections. The base plate carrys all components required for the performance of various functions, such as relays and restrictors. The components are interchangeable and further components can be added subsequently, so that the controller function can also be altered later (see paragraph 7.3).

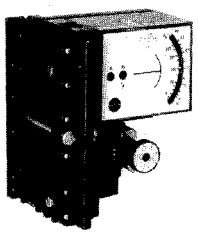
Type 3433-2 PI Controller (Fig. 3)

The controlled variable x (actual value) and the command variable w (set point) – both pneumatic signals of 0.2 and 1 bar – are fed to the metal bellows w and x via the turnboard A. When x exceeds w, the actual value bellows inclines the cross spring pivoted swashplate towards the set point bellows. Thus, the pressure behind the nozzle, which is connected to the swashplate by means of a pin, and the output pressure Y_A provided by the amplifier, increase.
The output pressure is fed back to the bellows R2 onto the swashplate via the turnboard B. The value of the output pressure and the position of the swashplate keep changing until the distance between nozzle and flapper reaches the initial value and the output pressure Y_A assumes a value related to the controlled variable x and the proportional-action coefficient K_p adjusted at a screw.
Outside the controller module, Y_A is connected to R, so that the output pressure Y_A is also fed back to the bellows R1 via the connection R and the adjustable T_n restrictor. Thus, the effect of the pressures in the bellows R1 and R2 is balanced and system deviation is eliminated. If a pressure occurs at the connection S after the controller station was set to manual operation, the T_n restrictor is bypassed via the T_n start-up relay.

The turnboard A determines the operating direction of the controller. By changing the position of the board, the operating direction can be changed. See paragraph 5.1.1.

The turnboard B determines the air supply to the feedback bellows. When supplied by the manufacturer, board B is set to Y_A, i.e the signal pressure Y_A is directly fed back to the bellows R 2. To the bellows R1, however, it is fed back via the manual control unit to the connection R. With this circuit arrangement, the controller shows normal air supply and damping of the output pressure. With the connection to R, the signal pressure Y_A is fed back to the belllows R 1 and R 2 via the connection R. This results in an increased air supply. This type of connection is useful for applications where the transmission path to the final control element is long and the connected volume is big, as well as in fast controlled systems. For adjustment or change of air supply by changing the position of the turnboard see paragraph 5.1.2.

The versions of controller modules described below largely correspond to the Type 3433-2 PI controller module. Depending on their application, however, they are equipped with e.g. an operating point adjuster, a derivative element or a selector switch.



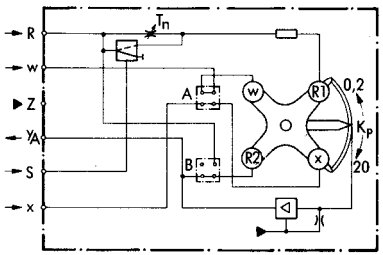


Fig. 3 · Type 3433-2 PI Controller module

The Type 3433-1 P Controller Module corresponds to the Type 3433-2 module. The integral element, however, is replaced by an operating point adjuster.

The Type 3433-3 PID Controller Module corresponds to the Type 3433-2 module. The Type 3433-4 PD Controller Module corresponds to the Type 3433-1. However, they are provided with a derivative element producing the rate action in the input branch of the controlled variable x. This element features a rate again of about 10 and a rate time which can be adjusted at the T_v restrictor.

The Type 3433-5 P/PI Controller Module with P/PI selector switch can be used either as P controller with operating point adjustment or as PI controller. The design corresponds to that of the PI and of the P controller module.

The Type 3433-6 PD/PID Controller Module with PD/PID selector switch can be used either as PD or as PID controller.

The Type 3433-9 P Controller Module with set point-dependent controlled operating point corresponds to the Type 3433-1 P controller module. The operating point, however, shifts proportionally to the set point w.

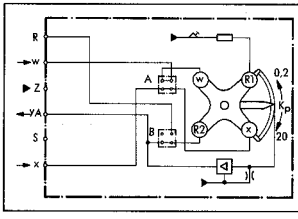


Fig. 3.1
Type 3433-1
P controller
module (turn-
board B is fixed)

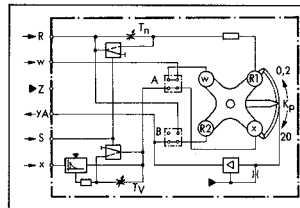


Fig. 3.2
Type 3433-3
PID controller
module

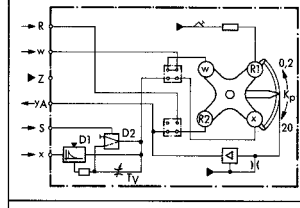


Fig. 3.3
Type 3433-4
PD controller
module (turn-
board B is fixed)

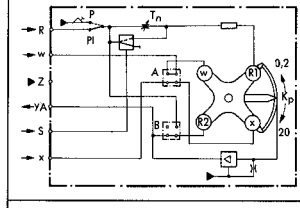


Fig. 3.4
Type 3433-5
P/PI controller
module

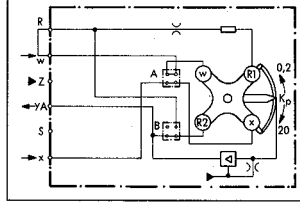
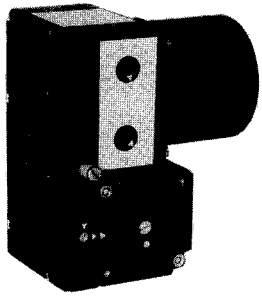
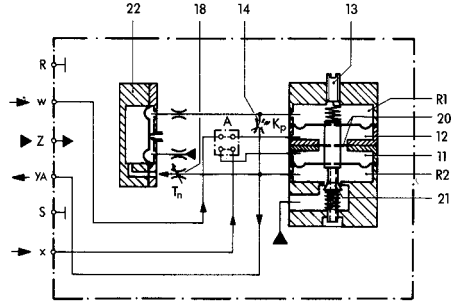


Fig. 3.5
Type 3433-9
P controller
module with set
point-dependent
operating point
(turnboard B
is fixed)





R1 Diaphragm chamber R1
R2 Diaphragm chamber R2
A Turnboard for adjustment of operating direction
11 Diaphragm chamber
12 Diaphragm chamber
13 Zero point adjuster
14 K_p restrictor
18 T_n restrictor
20 Diaphragm
21 Force switch with plug
22 1:1 booster, fixed operating point with P controller

Fig. 4 · Type 3434-2 PI Controller module

3.3.2 Type 3434 Controller modules

The controller modules are provided with a box-shaped comparator which operates according to the force-balance principle. The proportional-action coefficient K_p is adjustable at a restrictor within the range of 1 to 25.

Type 3434-2 PI Controller module (Fig. 4)

The controlled variable x and the command variable w – both pneumatic gauge pressures with values between 0.2...1 or 3...15 psi – are transmitted to the diaphragm chambers (11 and 12) via the turnboard A. When x exceeds w, the force switch (21) lowers and opens the plug. Supply air flows into the diaphragm chamber R2 and the output pressure Y_A increases. This pressure is fed into the volume of the 1:1 booster (22) via the T_n restrictor (18). The output pressure of the booster is fed back to the diaphragm chamber R1. The effect of the pressures in the diaphragm chambers R1 and R2 is balanced. The position of the force switch changes until the controller output pressure assumes a value related to the controlled variable x and the adjusted proportional-action coefficient K_p, i.e. until system deviation is eliminated. The proportional-action coefficient K_p is adjusted at the restrictor (14) and the reset time T_n at the restrictor (18). The zero point adjuster (13) is used to calibrate the module.

The **turnboard A** determines the operating direction of the controller. By changing the position of the board, the operating direction can be changed. See paragraph 5.1.1.

Type 3434-1 P Controller module

The design and the principle of operation of this module largely correspond to that of the Type 3434-2 PI controller module. However, the feedback element with T_n restrictor is replaced by a spring for fixed operating point adjustment at 0.6 bar.

3.4 Additional units

3.4.1 Type 6112 i/p Converter

In case of the **follower controller**, the external command variable can be a current signal of 4(0)...20 mA or 1...5 mA which can be converted into the pneumatic standardized signal of 0.2...1 bar by the i/p Controller. The i/p additional unit is installed in the controller station and can only be used in combination with the Type 3433 controller modules.

3.4.2 Selector switch W_{int}/W_{ext}

When being a combination of a **fixed set point controller** and a follower controller, the indicating controller is equipped with a W_{int}/W_{ext}-selector switch. Due to the corresponding set point adjuster and the differential pressure display, bumpless change-over is possible when the differential pressure display equals zero.

3.4.3 Supply pressure regulator

When the controller station is equipped with a supply pressure regulator, it is suitable to be provided with an operating pressure of 2.0 to 12 bar. The pressure regulator reduces the operating pressure and controls it to the required supply pressure p_z of 1.4 bar.

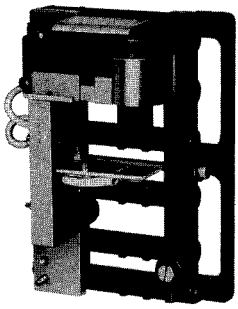


Fig. 5 · Additional unit for i/p conversion with i/p Converter for external command variable w_{ext}

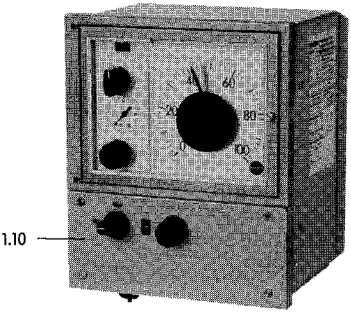


Fig. 6 · Fixed set point and follower controller with additional unit (1.10) for change-over internal from to external command variable

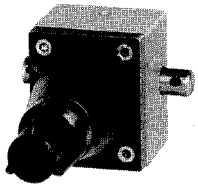


Fig. 7 · Supply pressure regulator

4. Installation

4.1 Mounting

The controller station is designed for tube mounting, wall mounting, and panel mounting. The corresponding dimensions are shown in Fig. 8.

Tube mounting: Mounting to a vertical or horizontal 2" tube by means of a fastening element with clamp. The order no. for the required mounting set is 1400-6302.

Wall mounting:
Mounting with three brackets. The order no. for the required mounting set is 1400-6301

Panel mounting:
Mounting with four fastening elements (DIN 43835, the order no. for the required mounting set is 1400-6300).

Dimensions in mm

With panel mounting, panel cut-out is $186^{+1} \times 222^{+1.5}$
Distance between center lines of the devices with door, approx. 235 mm.
Close-to-close arrangement in lines (without door) according to DIN 43700

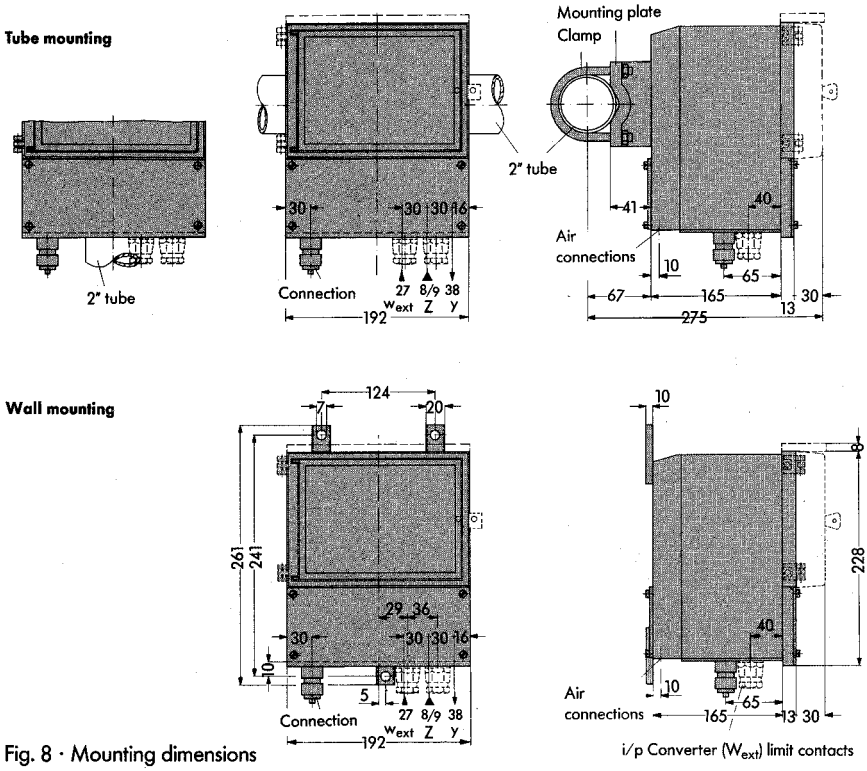


Fig. 8 · Mounting dimensions

Specifications subject to change without notice.

4.2 Pneumatic connections

The air connections at the bottom of the device are bore holes with a 1/8" NPT-thread. The conventional screw glands for pipes or plastic hoses can be used. The connection designations are marked on a sticker and mean:

Output 38 y – Manipulated variable, output signal of the controller for operation of the control valve

Supply 8/9 – Supply air, supply 1.4±0.1 bar or 2 to 12 bar for versions with supply pressure regulator (see paragraph 4.2.1)

Input 27 W_{ext} – External command variable, closed with fixed set point controller and open for connection of external set point at the follower controller.

Input 26 x – Controlled variable, closed (pressure signal input at the medium connection of the transmitter module)

4.2.1 Adjustment and control of the supply air at controller stations with supply pressure regulator

The hose connections for supply air are located right above the corners of the pressure controller on the frame of the connecting board (Fig. 15). The connections are sealed with hose ends. Remove left hose end and connect connection with testing gauge using a hose. Controller stations with manual/automatic switch are provided with a test connection (yellow) at the inner side of the indicating unit. Here, use enclosed test plug.

Screw off the cover of the pressure controller and adjust spindle until the supply pressure equals 1.4 ± 0.1 bar.

4.3 Medium connection

Connect the medium to be controlled to the respective connection of the transmitter module. Threaded connection: ISO 228 G 1/2 DIN 16288 flat packing).

4.4 Electrical connections

The electric equipment is only required for controller stations with the additional units i/p Converter for external command variable W_{ext} and/or with inductive limit contacts. Access to the terminals at the bottom plate can be obtained by screwing off the front cover below the display.

The terminals must be connected as depicted in Fig. 9.

For operation of the inductive limit contacts, appropriate transistor relays must be incorporated in the output circuit.

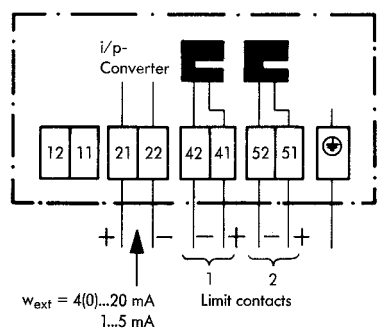


Fig. 9 · Electrical connections

5. Operation

5.1 Controller modules

Access to the controller module in the controller station can be obtained by releasing the locking of the front cover (Fig. 12) and opening out the display unit.

5.1.1 Adjustment of the operating direction (Fig. 10)

The position of the turnboard A (7) determines the operating direction of the controller module.

For adjustment or change of the operating direction of the controller module, release screw in the turnboard (7) and remove screw together with turnboard. Turn the board so that it indicates the desired operating direction according to the symbols on the base plate. Install board and fasten with screw.

Position of board A

- △ ▽ Operating direction increasing/decreasing; as controlled variable x increases – signal pressure Y_A decreases
- △ △ Operating direction increasing-increasing; as the controlled variable x increases – signal pressure Y_A increases

5.1.2 Adjustment of the air supply (only Type 3433)

The position of the turnboard B (4) determines the air supply to the feedback bellows. Access to this board can be obtained from the side when the screws (2) are released and the comparator (10) is removed from the base plate.

For adjustment or change of the air supply, release screw in the board (4) and remove screw together with board. Turn the board so that the arrow points to the symbol Y_A or R on the base plate. Install board and fasten with screw.

Position of board B

- Y_A △ – normal air supply
- ▷ R – increased air supply (not for P and PD controller module).

5.1.3 Adjustment of the proportional-action coefficient K_p

The K_p adjustment determines controller gain and depends on the controlled system to be optimized. See also paragraph 6.1.

The values of K_p are adjusted at the adjuster (9)

5.1.4 Adjustment of the reset time T_n.

In case of controller versions with I action, the reset time must be adjusted at a restrictor (11). The value to be adjusted depends on the controlled system to be optimized (paragraph 6.1).

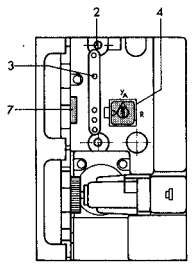
5.1.5 Adjustment of the rate time T_v

With Type 3433 controller versions with D action, the rate time T_v must be adjusted at a restrictor (11). The value to be adjusted depends on the controlled system to be optimized (paragraph 6.1).

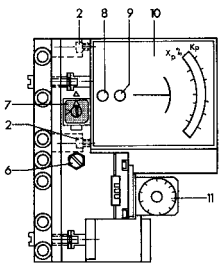
5.1.6. Adjustment of the operating point

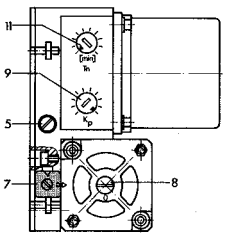
Controller modules with no I action, such as P or PD Controllers, have an operating point. In case of the Type 3433 controller module, the operating point is adjustable with an adjuster to 0...100 % ≙ 0.2...1 bar. The adjustment depends on the value of the manipulated variable y (paragraph 6.1.1).

The **Type 3434** P controller module has a **fixed operating point** (at 0.6 bar).



Side view of comparator (10) unscrewed





2 Comparator fastening screw
3 Comparator connections
4 Turnboard B (air supply)
5 Controller module fastening screw
6 Prerestrictor
7 Turnboard A (operating direction)
8 Zero adjusting screw
9 K_p adjusting screw
10 Comparator
11 Restrictor, adjuster T_n

Fig. · 10 Adjusters

5.2 Adjustment of the limit contacts (Fig. 11)

For the adjustment of the limit contacts, release locking at the front cover and open out the display unit. The contacts are located at the back.

Use screwdriver to shift the limit contacts between 0 and 100 % of the auxiliary scale until a contact is made via the transistor relay.

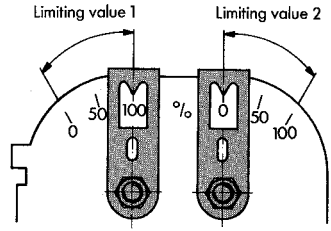


Fig. 11 · Limit contacts

6. Start-up

Prior to control loop start-up, all instruments should be checked for proper connection, leakage and operation.

After releasing the locking at the front cover, open out display unit to obtain access to the operator controls at the controller.

Check operating direction, adjusted at the controller module, at the turnboard (see paragraph 5.1.1.).

6.1 Optimization of the controller

In order to enable the controller to reduce system deviations, caused by disturbances, to zero for all set points or to keep such deviations within close limits, the controller must be adapted to the response of the controlled system by setting the parameters K_p, T_n or T_v at the controller module.

We recommend to determine the respective set values in an oscillation test (performed according to the Ziegler and Nichols method), which in most cases is adequate. For this purpose proceed as follows:

Turn on supply air (1.4 $\pm$ 0.1 bar).

Set the proportional-action coefficient at the comparator to a lower value.

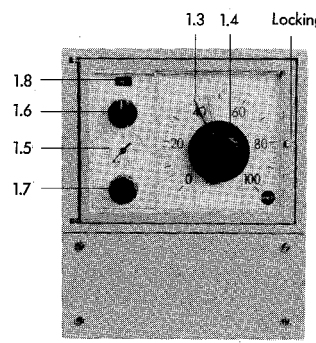
Set the T_n restrictor to the maximum value and T_v to the minimum value (only with PI and PID controller).

Adjust set point to the desired value using the knob at the display unit.

In case of controller stations, which are equipped with a **manual/automatic switch** (1.6), we recommend to start up the unit manually. For this purpose set manual/automatic switch to **Manual**.

Operate manual adjuster (1.7) in such a way that the controlled variable (actual value pointer 1.3) slowly approaches the adjusted set point (set point pointer 1.4).

When the differential pressure display (1.8) equals zero, set selector switch (1.6) to **-Automatic-**.



1.3 Actual value pointer
1.4 Set point adjuster with pointer
1.5 Signal pressure display
1.6 Manual/automatic – switch
1.7 Adjuster for manual-signal pressure
1.8 Differential pressure display

Fig. 12 · Display unit

Increase the proportional-action coefficient K_p, starting from the low set value, until the actual value pointer indicates harmonic oscillation of the controlled variable (uniform amplitudes see Fig. 13). When no oscillation occurs with large K_p, slightly change set point with the respective knob. Then, set same to the previous value. If necessary, slightly increase gain (K_p) until harmonic oscillation occurs.

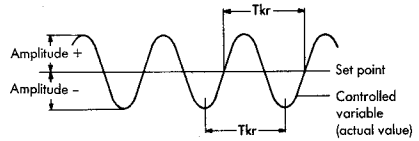
Take down the value now set on the K_p scale as critical proportional factor $K_{p\,crit}$.

Use a watch to determine the time required for a complete oscillation to take place as T_{crit} (only PI and PID controllers).

Multiply both values with the values listed in the table (Fig. 13) and adjust the resulting values as the optimum values for K_p, T_n and T_v at the controller.

If oscillation occurs in spite of these set values, the parameter values for K_p must be slightly decreased and T_n must be increased.

If necessary, repeat these steps until the control system operates satisfactorily. When an adjustment was made, the controller should be given enough time to adapt itself to the new condition.



Controller	K_p	T_n	T_v
P	0.5	–	–
PI	0.45	0.85	–
PID	0.59	0.5	0.12

Fig. 13 · Harmonic oscillation, Table of setting values

6.1.1 Adjustment of the operating point with P and PD controllers (only Type 3433 controller module)

With P and PD controllers, the operating point must be adjusted instead of the reset time when the proportional-action coefficient K_p was adjusted as described above.

When the controller is in the steady state condition proceed as follows: Read the value of the signal pressure Y_A indicated on the display (1.5) and directly set this value with the operating point adjuster (set values 0.2...1 bar ≙ 0...100 %). Correct slightly until system deviation equals zero. When the indicated signal pressure varys, the value of the operating point must be determined.

When the set point or the command variable are changed, the operating point must be adjusted again as described above.

When the command variable is frequently changed across its range, set operating point to 0.6 bar ≙ 50 % (average value).

Note

When the P/PI controller is switched to P action control, the T_n restrictor must be opened fully, so that the operating point adjuster can immediately become effective.

Version with w-dependent operating point

With this version, adjustment of the operating point is not necessary, since it automatically assumes the same values as the set point.

6.2 Bumpless change-over from automatic to manual operation and vice versa (Fig. 12) (only for controller station with manual/automatic-switch)

Bumpless change-over shall ensure that no pressure surge can affect the valve when the manual/automatic switch is operated. For bumpless change-over proceed as follows:

Change-over from automatic to manual operation

Adjust signal pressure Y_H with the manual adjuster (1.7) until the differential pressure display (1.8) indicates zero. Now, the switch can be set to **Manual**.

Change-over from manual to automatic operation

If the desired value was adjusted manually, signal pressure Y_A must be aligned with signal pressure Y_H using the set point adjuster (1.4). It is only possible to set the switch (1.6) to Automatic when the differential pressure display (1.8) indicates zero.

6.3 Readjustment of the controller zero point

If deviations between actual value and set point occur during operation, when the controller is in the steady state condition, readjustment of the zero point will be possible by changing the setting of the zero screw **Zero** at the back of the display unit until actual value and set point coincide.

Furthermore, deviations from set point and actual value can be adjusted at the controller module (Pos. 8, Fig. 10).

7. Maintenance

7.1 Checking the air supply

Normally, the components of the pneumatic indicating controller are maintenance-free. However, the air supply should be checked from time to time. Proper operation of the instruments is only ensured when the supplied air is always in a well cleaned condition. Air filters and traps of the reducing station must be checked at regular intervals. When a drop in performance occurs, the respective filter must be cleaned or replaced, if necessary.

Transmitter module

A nipple, which is provided with a sieve, is located in the feeding end of the supply air hose. If the controlled variable is not indicated, the sieve must be cleaned or replaced. Order no. 0550-0193.

Type 3433 Controller modules

If the controller module should not drive to full output or there should be no output signal at all, the prerestrictor (Fig. 10) on the left, below the comparator, must be unscrewed and cleaned. If necessary, replace sieve with a new one (order no. 0550-0193). The plug-in connections of the controller module are also equipped with sieves (order no. 0550-0186).

Furthermore, the connections at the bottom of the housing are provided with sieves with plastic rims (order no. 0550-0189) which can be unscrewed and cleaned.

7.2 Changing the scale

After releasing the locking at the front cover, the scale can be withdrawn from the back of the display unit and, if necessary, be replaced with a special scale.

Inside the housing, adhesive tapes are attached which can be used to mark the measuring points on the scale. Cut the tapes as required and stick them on the scale.

7.3 Changing the controller action

The controller action can be changed either by replacing the complete module (Type 3434-1 or 3434-2) or by providing it (Type 3433) with components such as adjusters, restrictors or relays.

Type 3433 Controller modules

P into PI action Unscrew the operating point adjuster (1) and replace it with a T_n restrictor (3).

P into P/PI action Unscrew the operating point adjuster (1) and replace it with an adjuster with change-over switch (2) and T_n restrictor (3).

P into PD action Unscrew the cover plate (4.1). Remove O-ring (4.3) and replace it with two O-rings (4.4). Open the differential amplifier (4). Unscrew cover plate (5.1) and install T_v restrictor (5).

P into PID action Proceed as specified for "P into PD action". In addition, replace adjuster (1) with T_n restrictor (3).

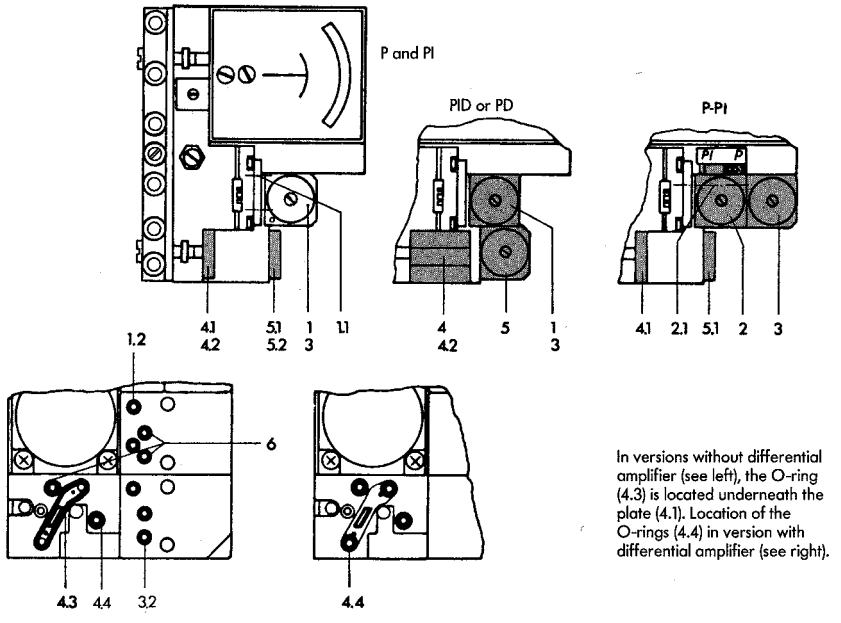
Special version of P controller with set point-dependent operating point.

In this case, the restrictor must be installed with screws, instead of the adjuster.

All components required for controller modification are listed in the table on the right. We recommend to replace old O-rings and the sieve in the prerestrictor (6) with new ones (Fig. 10).

Table for controller modification

Pos.	Number	Designation	Order No.
1	1	Remote adjuster for operating point 1.4 bar	1070-4583
		20 psi	1070-6413
1.1	2	Screws M3 x 8	8333-0479
1.2	4	O-rings 1.78 x 1.02	8421-0010
2	1	Remote adjuster with change-over switch	1080-6909
2.1	2	Screws M3 x 30	8333-0482
	4	O-rings as pos. 1.78 x 1.02	8421-0010
3	1	T_n-restrictor	1070-4584
3.1	2	Screws m^3 x 16	8333-0476
3.2	3	O-rings 1.78 x 1.02	8421-0010
4	1	Differential amplifier	1080-6924
4.1	1	Cover plate	0360-1598
4.2	1	Screw M3 x 16	8333-0476
4.3	1	O-ring 14 x 1.5 for plate	8421-0070
4.4	4(2)	O-rings 2 x 1.5	8421-0023
5	1	T_v-restrictor	1070-4585
5.1	1	Cover plate	0360-1597
5.2	2	Screws M3 x 8	8333-0479
5.3	4	O-rings 2 x 1.5	8421-0023
	1	Restrictor for set point-dependent operating point	1590-1089



In versions without differential amplifier (see left), the O-ring (4.3) is located underneath the plate (4.1). Location of the O-rings (4.4) in version with differential amplifier (see right).

Fig. 14 · Changing the controller action (only Type 3433)

7.4 Replacing the Type 3435 transmitter module

Unscrew front plate below the display and remove hoses for controlled variable **x** and supply air **z** from the connecting board.

Release the six fastening screws at the bottom of the housing and remove base plate with measuring element (transmitter module). Remove measuring element after having released the three fastening screws and replace it with a new one (see table of measuring elements). Install transmitter module and reinstall hoses for controlled variable **x** and supply air **z** at the connecting board (Fig. 15). Do not confuse hoses (at its feeding end, the hose for supply air is provided with a plastic nipple with a restrictor and a sieve).

Screw on front plate.

Table of measuring elements

Measuring range	Order No.
0...1.6 bar	1079-0360
0...24 psi	1079-0370
0...2.5 bar	1079-0361
0...36 psi	1079-0371
0...4 bar	1079-0362
0...60 psi	1079-0372
0...6 bar	1079-0363
0...90 psi	1079-0373
0...10 bar	1079-0364
0...150 psi	1079-0374
0...16 bar	1079-0365
0...240 psi	1079-0375
0...25 bar	1079-0366
0...360 psi	1079-0376
0...40 bar	1079-0367
0...600 psi	1079-0377

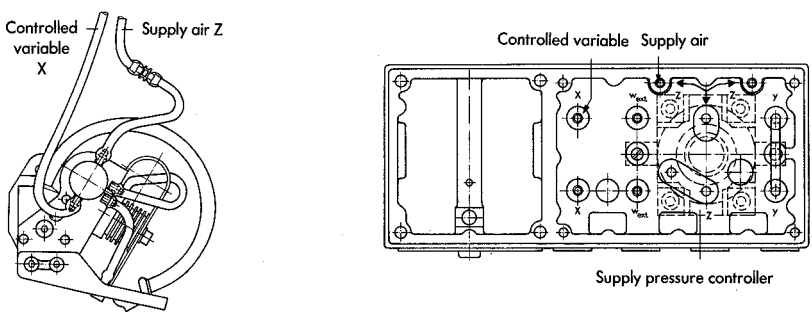


Fig. 15 · Measuring element and connecting board

7.5 Checking the controller action

In order to check the controller action, the controlled variable x and the controller output y must be short-circuited at the connections at the bottom of the controller station. The turnboard A must be set to increasing/decreasing, the T_n restrictor to "fully open", and the T_v restrictor to "closed".

Use set point adjuster to vary command variable across its entire range. When the controller operates properly, the controller variable display and the controller output signal display follow the values of the command variable across the entire display range.

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