

# STAP



## Differential pressure controllers

DN 15-50, adjustable set-point and shut-off function

# STAP

STAP is a high-performing differential pressure controller that keeps the differential pressure over the load constant. This delivers accurate and stable modulating control, ensures less risk of noise from control valves, and results in easy balancing and commissioning. STAP's unrivalled accuracy and compact size make it particularly suitable for use on the secondary side of heating and cooling systems.

## Key features

- > **Pressure relief cone**  
Ensures accurate differential pressure control.
- > **Measuring point with drain option**  
Simplifies the balancing procedure, and increases its accuracy.
- > **Adjustable set-point and shut-off function**  
Delivers desired differential pressure ensuring accurate balancing. Shut-off function makes maintenance easy and straightforward.



## Technical description

### Application:

Heating and cooling systems.

### Functions:

Differential pressure control  
Adjustable  $\Delta p$   
Measuring point  
Shut-off  
Draining (accessory)

### Dimensions:

DN 15-50

### Pressure class:

PN 16

### Max. differential pressure ( $\Delta p_V$ ):

250 kPa

### Setting range:

DN 15 LF: 5\* - 25 kPa  
DN 15 - 20: 5\* - 25 kPa  
DN 32 - 40: 10\* - 40 kPa  
DN 15 LF: 10\* - 60 kPa  
DN 15 - 25: 10\* - 60 kPa  
DN 32 - 50: 20\* - 80 kPa  
\*) Delivery setting  
LF = Low flow

### Temperature:

Max. working temperature: 120°C  
Min. working temperature: -20°C

### Media:

Water or neutral fluids, water-glycol mixtures (0-57%).

### Material:

Valve body: AMETAL®  
Bonnet: AMETAL®  
Cone: AMETAL®  
Spindles: AMETAL®  
O-rings: EPDM rubber  
Membrane: HNBR rubber  
Spring: Stainless steel  
Spring support: AMETAL® and reinforced PPS  
Handwheel: Polyamide

AMETAL® is the dezincification resistant alloy of IMI Hydronic Engineering.

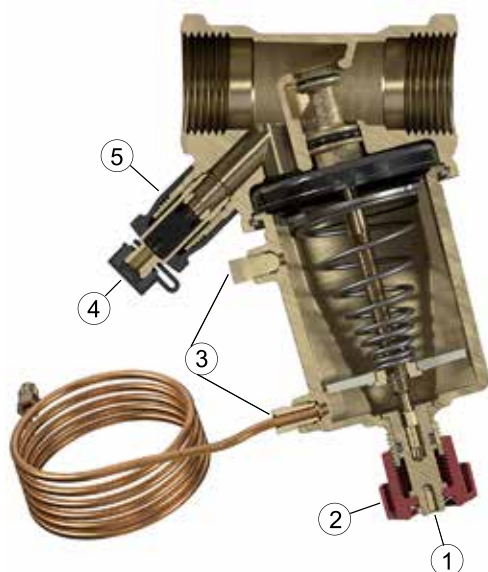
### Marking:

Body: IMI or TA, PN 16/150, DN, inch size and flow direction arrow.  
Bonnet: STAP,  $\Delta p_L$  5-25, 10-40, 10-60 or 20-80.

### Connection:

Female thread according to ISO 228, thread length according to ISO 7-1.

## Operating function



1. Setting  $\Delta p_L$  (3 mm allen key)
2. Shut-off
3. Connection capillary pipe
  - Venting
  - Connection measuring point STAP
4. Measuring point
5. Connection draining kit (accessory)

### Measuring point

Remove the cover and then insert the probe through the self-sealed measuring point.

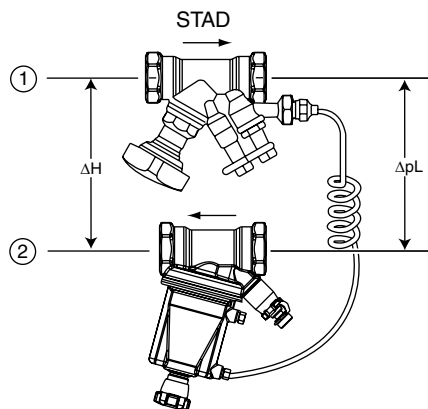
Measuring point STAP (accessory) can be connected to the venting if the STAD valve is out of reach for measuring of differential pressure.

### Drain

Draining kit available as accessory. Can be connected during operation.

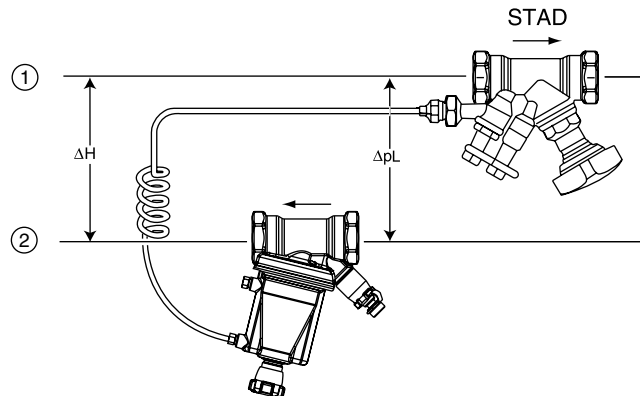
## Installation

With  $\Delta p_V$  STAD **excluded** from the load.  
(Best suited for Application examples 1, 3, 4 and 5)



1. Inlet
2. Return

With  $\Delta p_V$  STAD **included** in the load.  
(Best suited for Application example 2)



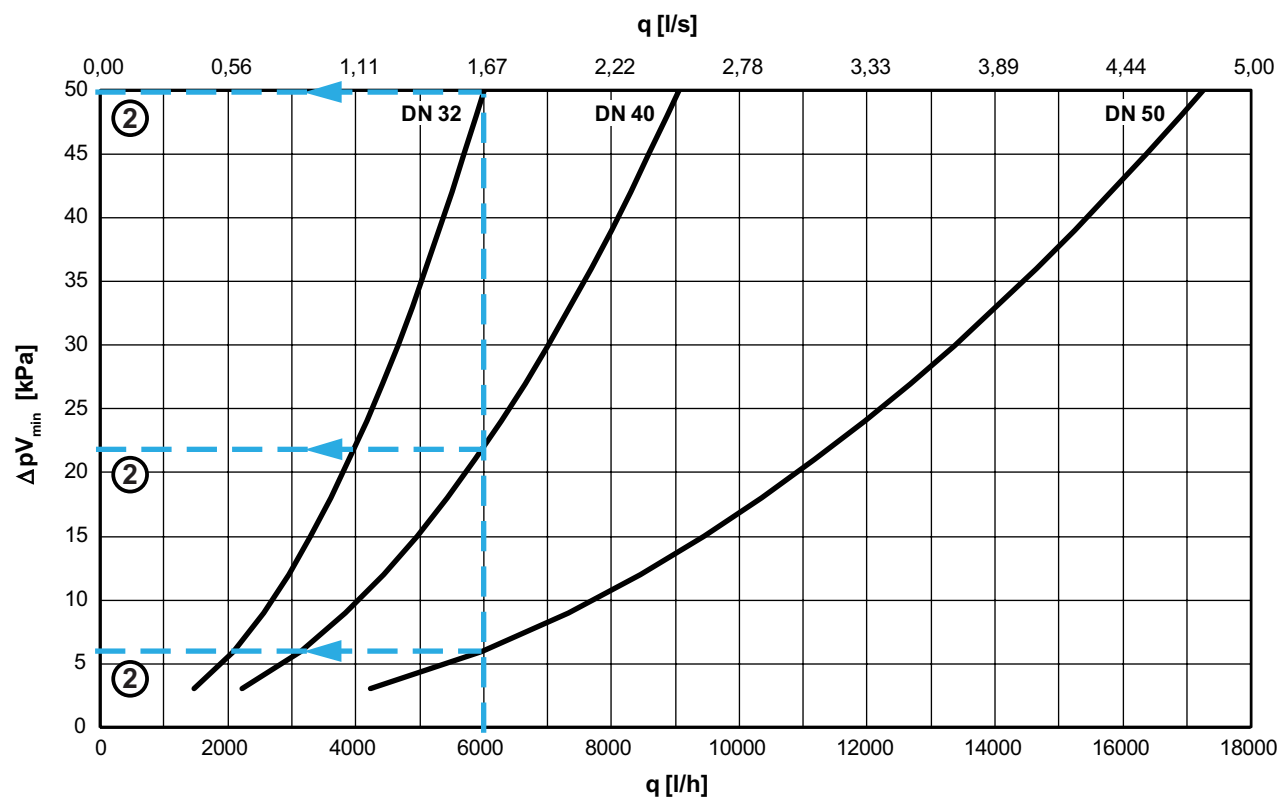
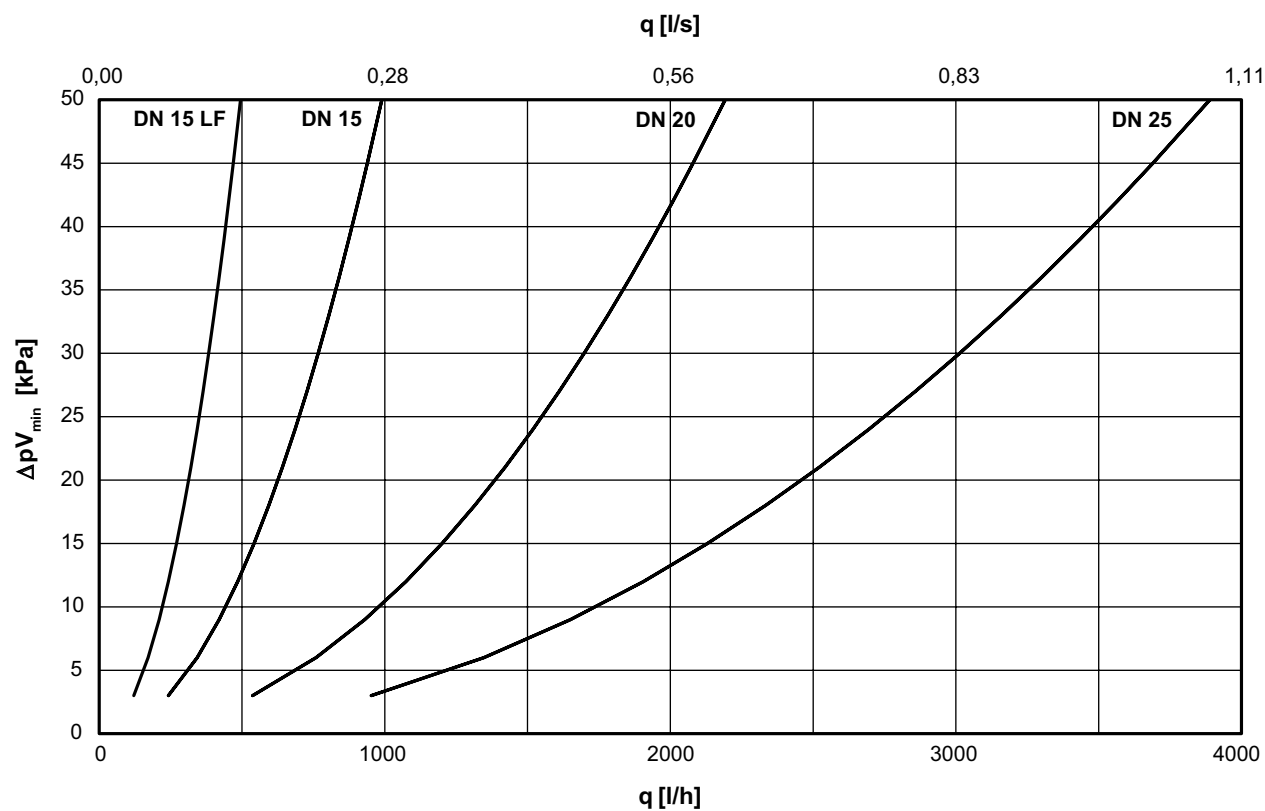
**Note!** The STAP must be placed in the return pipe and with correct flow direction.  
To simplify installations in tight spaces, the bonnet can be detached.

When extending the capillary pipe, use e.g. 6 mm copper pipe and extension kit (accessory). **Note!** The supplied capillary pipe must be included.

For further installation examples, see Handbook No 4 - Hydronic balancing with differential pressure controllers.  
STAD – see catalogue leaflet "STAD".

## Sizing

The diagram shows the lowest pressure drop required for the STAP valve to be within its working range at different flows.



LF = Low flow

### Example:

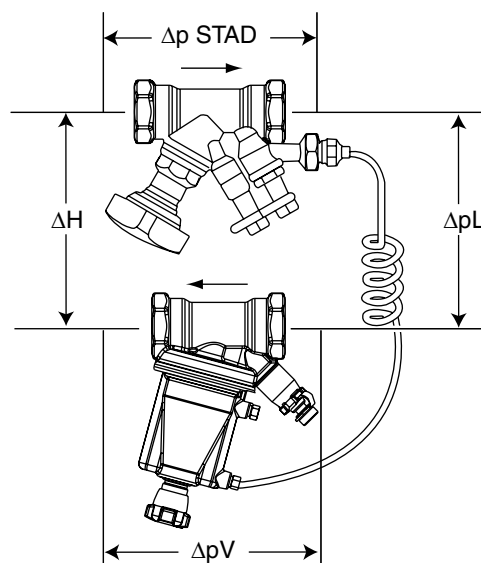
Design flow 6 000 l/h,  $\Delta p_L = 23$  kPa and available differential pressure  $\Delta H = 60$  kPa.

1. Design flow ( $q$ ) 6 000 l/h.
2. Read the pressure drop  $\Delta pV_{min}$  from the diagram.  
 DN 32  $\Delta pV_{min} = 50$  kPa  
 DN 40  $\Delta pV_{min} = 22$  kPa  
 DN 50  $\Delta pV_{min} = 6$  kPa
3. Check that the  $\Delta pL$  is within the setting range for these sizes.
4. Calculate required available differential pressure  $\Delta H_{min}$ .  
 At 6 000 l/h and fully open STAD the pressure drop is, DN 32 = 18 kPa, DN 40 = 10 kPa and DN 50 = 3 kPa.

$$\Delta H_{min} = \Delta pV_{STAD} + \Delta pL + \Delta pV_{min}$$

$$\begin{aligned} \text{DN 32: } \Delta H_{min} &= 18 + 23 + 50 = 91 \text{ kPa} \\ \text{DN 40: } \Delta H_{min} &= 10 + 23 + 22 = 55 \text{ kPa} \\ \text{DN 50: } \Delta H_{min} &= 3 + 23 + 6 = 32 \text{ kPa} \end{aligned}$$

5. In order to optimise the control function of the STAP select the smallest possible valve, in this case DN 40. (DN 32 is not suitable since  $\Delta H_{min} = 91$  kPa and available differential pressure 60 kPa only).



$$\Delta H = \Delta pV_{STAD} + \Delta pL + \Delta pV$$

IMI Hydronic Engineering recommends the software HySelect for calculating the valve size. HySelect can be downloaded from [www.imi-hydronic.com](http://www.imi-hydronic.com).

## Working range

	$Kv_{min}$	$Kv_{nom}$	$Kv_m$	$q_{max}$ [m³/h]
DN 15 LF	0,05	0,17	0,7	0,5
DN 15	0,07	1,0	1,4	1,0
DN 20	0,16	2,2	3,1	2,2
DN 25	0,28	3,8	5,5	3,9
DN 32	0,42	6,0	8,5	6,0
DN 40	0,64	9,0	12,8	9,1
DN 50	1,2	17,0	24,4	17,3

$Kv_{min}$  = m³/h at a pressure drop of 1 bar and minimum opening corresponding to the p-band (+20% respectively +25%).

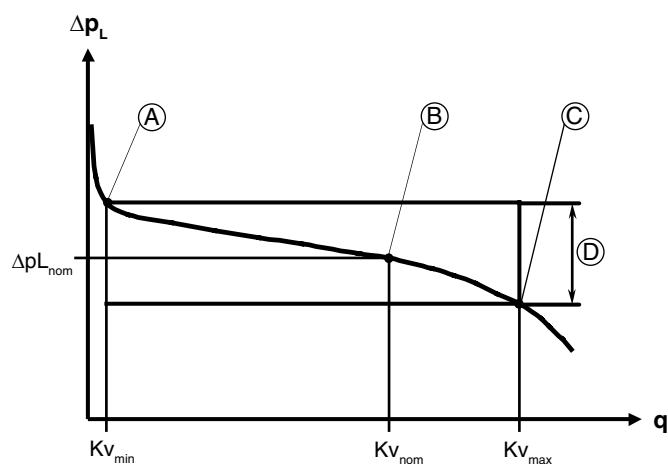
$Kv_{nom}$  = m³/h at a pressure drop of 1 bar and opening corresponding to the middle of the p-band ( $\Delta pL_{nom}$ ).

$Kv_m$  = m³/h at a pressure drop of 1 bar and maximum opening corresponding to the p-band (-20% respectively -25%).

LF = Low flow

**Note!** The flow in the circuit is determined by its resistance, i.e.  $Kv_C$ :

$$q_C = Kv_C \sqrt{\Delta pL}$$



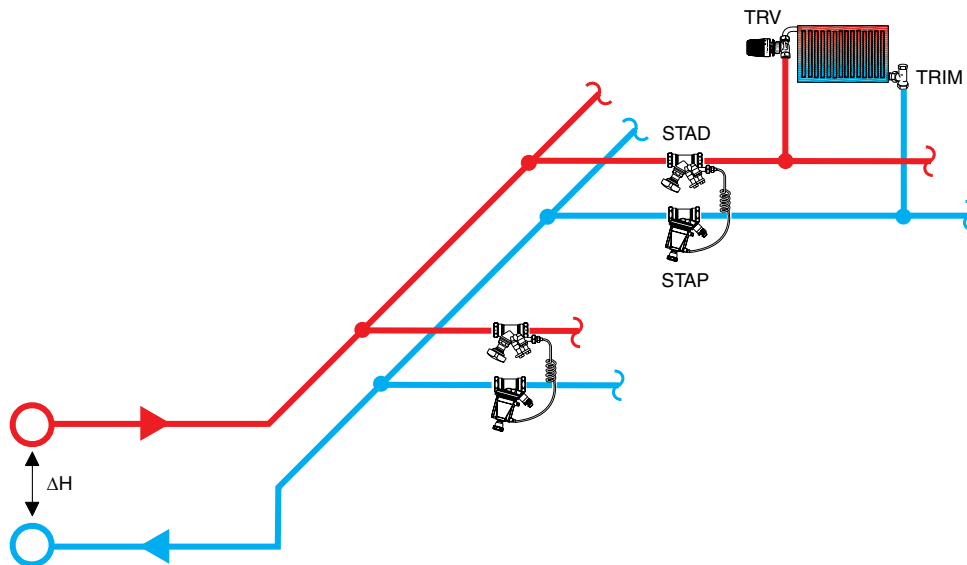
- A.  $Kv_{min}$
- B.  $Kv_{nom}$  (Delivery setting)
- C.  $Kv_m$
- D. Working range  $\Delta pL_{nom} \pm 20\%$ . STAP 5-25 and 10-40 kPa  $\pm 25\%$ .

## Application examples

### 1. Stabilising the differential pressure across a circuit with presettable radiator valves

In plants equipped with presettable radiator valves (TRV), it is easy to get a good result. The presetting of the radiator valves limit the flow so that overflows do not occur. STAP limits the differential pressure and prevents noise.

- STAP stabilises  $\Delta p_L$ .
- The preset Kv-value of TRV limits the flow in each radiator.
- STAD is used for flow measuring, shut-off and connection of the capillary pipe.

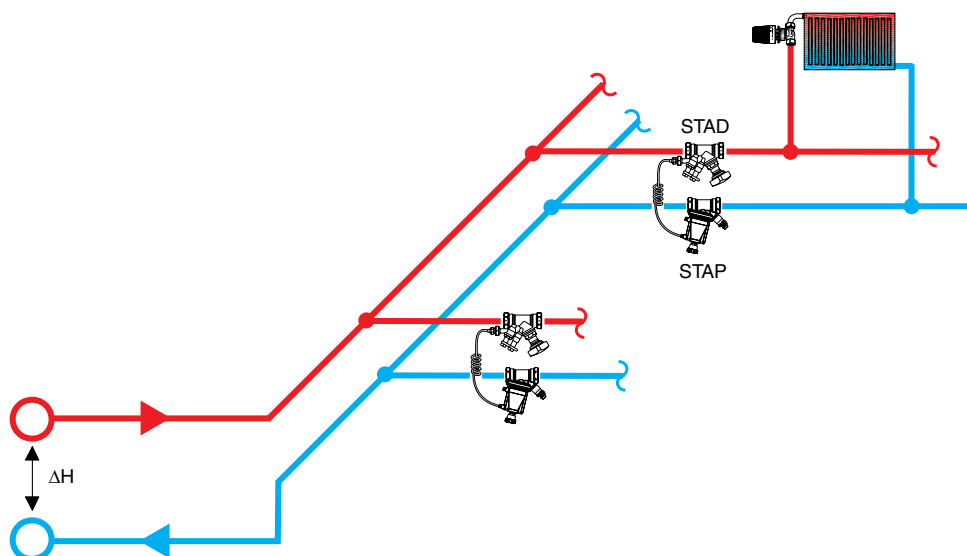


### 2. Stabilising the differential pressure across a circuit with non-presettable radiator valves

In plants equipped with non-presettable radiator valves it is not so easy to get an optimal result. Such radiator valves are common in older plants and will not limit the flow, which can be significantly too high in one or several circuits. Consequently, it is not enough that STAP limits the differential pressure across each circuit.

Letting STAP work together with STAD will solve the problem. STAD limits the flow to design value (using our balancing instrument to find the correct value). The correct distribution of the total flow between the radiators is however not achieved, but this solution can significantly improve a plant equipped with non-presettable radiator valves.

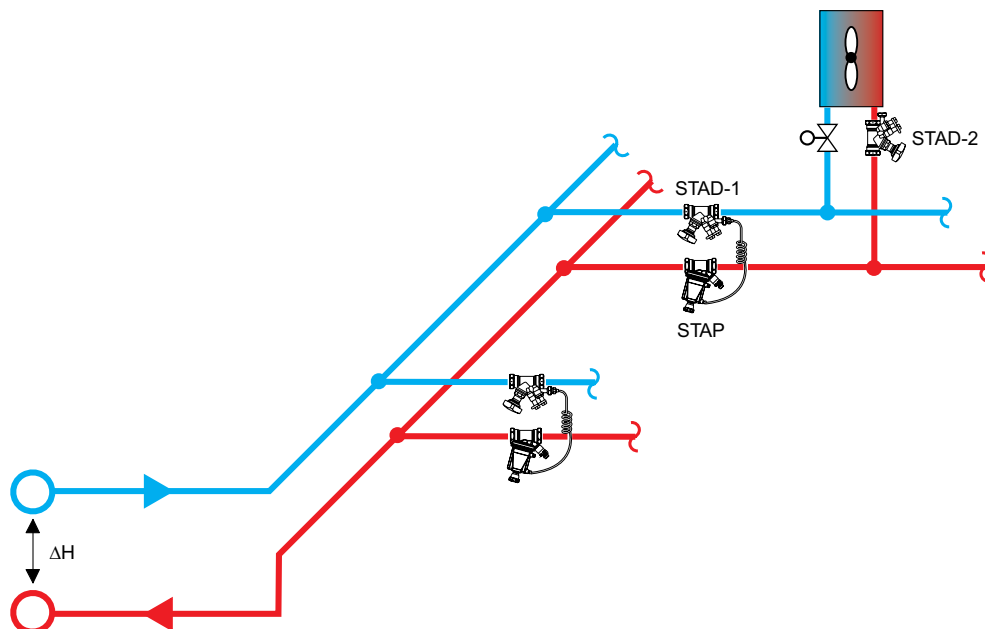
- STAP stabilises  $\Delta p_L$ .
- There is no presettable Kv-value on the radiator valve in order to limit the flow in each radiator.
- STAD limits the total flow in the circuit.



### 3. Stabilising the differential pressure across a circuit with control and balancing valves

When several small terminal units are close to one another, the differential pressure can be stabilised by using STAP in combination with STAD-1 across each circuit. STAD-2 for each terminal unit limits the flow and STAD-1 is used to measure the flow.

- STAP stabilises  $\Delta p_L$ .
- The set Kv-value in STAD-2 limits the flow in each terminal unit.
- STAD-1 is used for flow measuring, shut-off and connection of the capillary pipe.

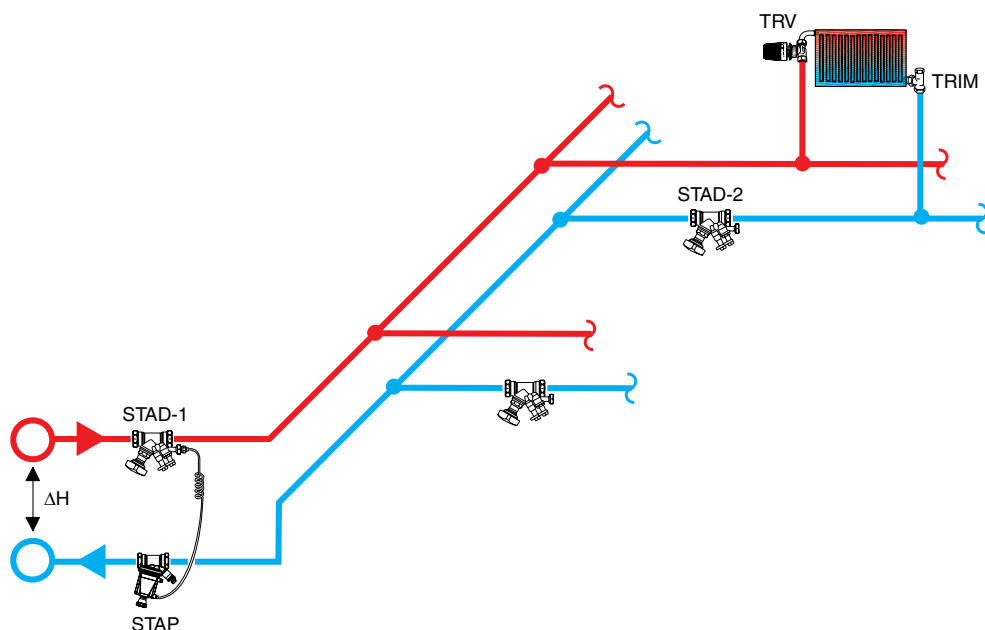


### 4. Stabilising the differential pressure across a riser with balancing valves (“Modular valve method”)

The “Modular valve method” is suitable when a plant is put into operation phase. Install one differential pressure controller on every riser, so that each STAP controls one module.

STAP keeps the differential pressure from the main pipe at a stable value out to the risers and circuits. STAD-2 downstream on the circuits guarantees that overflows do not occur. With STAP working as a modular valve, the whole plant does not need to be re-balanced when a new module is taken into operation. There is no need for balancing valves on the main pipes (except for diagnostic purposes), since the modular valves distribute the pressure out to the risers.

- STAP reduces a big and variable  $\Delta H$  to a suitable and stable  $\Delta p_L$ .
- The set Kv-value in STAD-2 limits the flow in each circuit.
- STAD-1 is used for flow measuring, shut-off and connection of the capillary pipe.

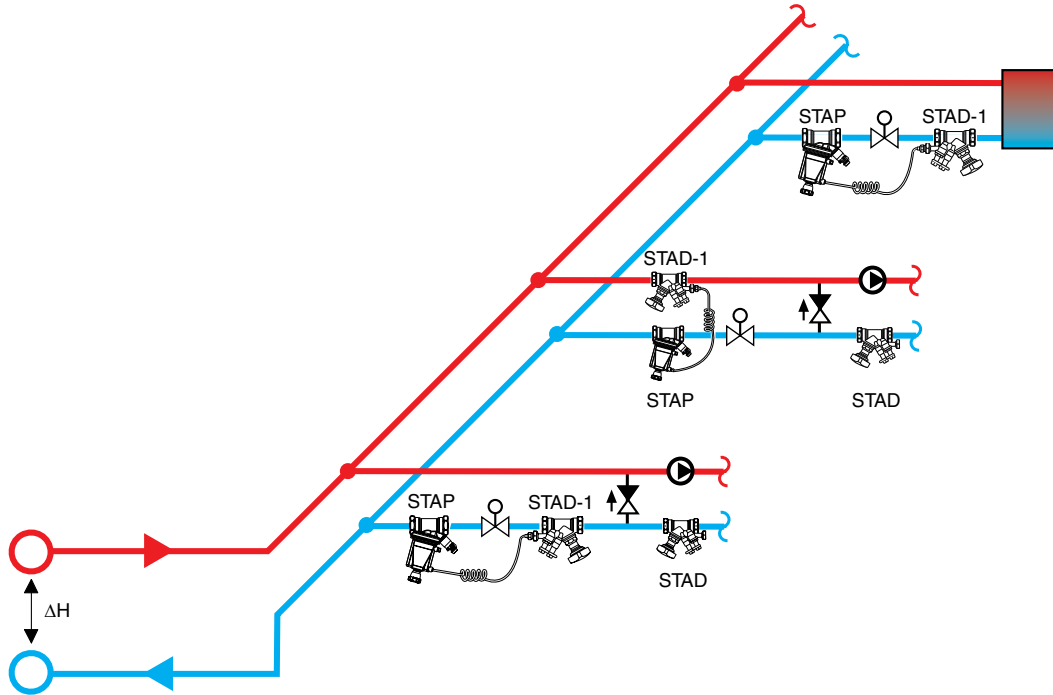


### 5. Keeping the differential pressure across a control valve constant

Depending on the design of the plant, the available differential pressure across some circuits can vary significantly with the load. To keep the correct control valve characteristic in such a case, the differential pressure across the control valves can be kept almost constant by a STAP connected directly across each control valve. The control valve will not be over-sized and the authority is and will remain close to 1.

If all control valves are combined with STAP, there is no need for other balancing valves, except for diagnostic purposes.

- STAP keeps  $\Delta p$  across the control valve constant, giving a valve authority  $\sim 1$ .
- The Kvs of the control valve and the chosen  $\Delta p$  gives the design flow.
- STAD-1 is used for flow measuring, shut-off and connection of the capillary pipe.



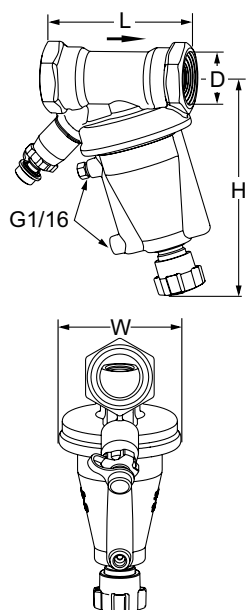
### Sizing the control valve

A control valve should give a flow of 1000 l/h at a  $\Delta H$  varying between 55 and 160 kPa.

- With a differential pressure of 10 kPa over the control valve, the Kvs will be 3,16.
- Control valves are normally available with Kvs-values according to the series 0,25 – 0,4 – 0,63 – 1,0 – 1,6 – 2,5 – 4,0 – 6,3 .....
- Choose Kvs=2,5, which will give a  $\Delta p$  of 16 kPa. Since the STAP guarantees a high control valve authority, a low pressure drop over the control can be chosen. Therefore, choose the biggest Kvs value that gives a  $\Delta p$  above the minimum set point of STAP (i.e. 5, 10 or 20 kPa depending on size and type).
- Adjust STAP to give  $\Delta p_L = 16$  kPa. Check the flow with TA balancing instrument over STAD-1 and with the control valve fully open.



## Articles



### Female threads

1 m capillary pipe and transition nipples G1/2 and G3/4 are included.

DN	D	L	H	W	Kv <sub>m</sub>	q <sub>max</sub> [m³/h]	Kg	Article No
<b>5-25 kPa</b>								
15* LF	G1/2	84	137	72	0,7	0,5	1,1	52 264-115
15*	G1/2	84	137	72	1,4	1,0	1,1	52 265-115
20*	G3/4	91	139	72	3,1	2,2	1,2	52 265-120
<b>10-40 kPa</b>								
32	G1 1/4	133	179	110	8,5	6,0	2,6	52 265-132
40	G1 1/2	135	181	110	12,8	9,1	2,9	52 265-140
<b>10-60 kPa</b>								
15* LF	G1/2	84	137	72	0,7	0,5	1,1	52 264-015
15*	G1/2	84	137	72	1,4	1,0	1,1	52 265-015
20*	G3/4	91	139	72	3,1	2,2	1,2	52 265-020
25	G1	93	141	72	5,5	3,9	1,3	52 265-025
<b>20-80 kPa</b>								
32	G1 1/4	133	179	110	8,5	6,0	2,6	52 265-032
40	G1 1/2	135	181	110	12,8	9,1	2,9	52 265-040
50	G2	137	187	110	24,4	17,3	3,5	52 265-050

→ = Flow direction

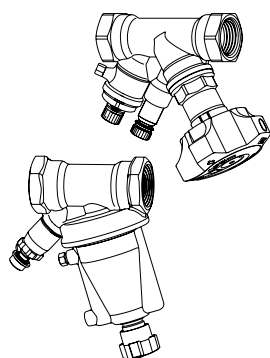
LF = Low flow

Kv<sub>m</sub> = m³/h at a pressure drop of 1 bar and maximum opening corresponding to the p-band (-20% respectively -25%).

\*) Can be connected to smooth pipes by KOMBI compression coupling. See accessories or catalogue leaflet KOMBI.

G = Thread according to ISO 228. Thread length according to ISO 7-1.

## STAP/STAD



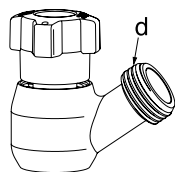
### STAP/STAD package

For more information on STAD see separate catalogue leaflet

STAP DN	STAD DN	Article No
<b>5-25 kPa</b>		
15 LF	10	52 864-301
15 LF	15	52 864-302
15	15	52 865-301
20	20	52 865-302
<b>10-40 kPa</b>		
32	32	52 865-303
40	40	52 865-304
<b>10-60 kPa</b>		
15 LF	10	52 864-111
15 LF	15	52 864-112
15	10	52 865-111
15	15	52 865-112
20	20	52 865-113
25	25	52 865-114
<b>20-80 kPa</b>		
32	32	52 865-115
40	40	52 865-116
50	50	52 865-117

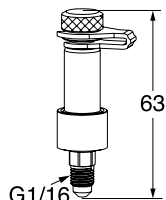
LF = Low flow

## Accessories



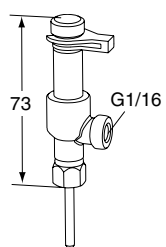
### Draining kit STAP

d	Article No
G1/2	52 265-201
G3/4	52 265-202



### Measuring point STAP

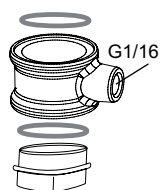
Article No
52 265-205



### Measuring point, two-way

For connection of capillary pipe while permitting simultaneous use of our balancing instrument.

Article No
52 179-200



### Connection sleeve kit for capillary pipe

For use on STAD or STS. Replacement of existing draining.

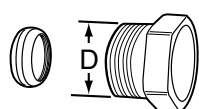
Article No
52 265-216



### Extension kit for capillary pipe

Complete with connections for 6 mm pipe

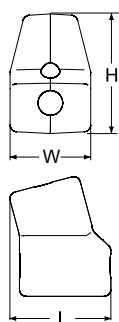
Article No
52 265-212



### Compression connection KOMBI

See catalogue leaflet KOMBI.

D	Pipe Ø	Article No
G1/2	10	53 235-109
G1/2	12	53 235-111
G1/2	14	53 235-112
G1/2	15	53 235-113
G1/2	16	53 235-114
G3/4	15	53 235-117
G3/4	18	53 235-121
G3/4	22	53 235-123



### Insulation STAP

For heating/cooling

Material: EPP

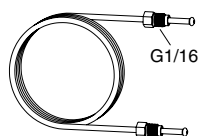
Fire class: B2 (DIN 4102)

Max working temperature: 120°C  
(intermittent 140°C)

Min working temperature: 12°C, -8°C at  
sealed joints

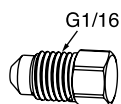
For DN	L	H	W	Article No
15-25	145	172	116	52 265-225
32-50	191	234	154	52 265-250

## Spare parts



### Capillary pipe

L	Article No
1 m	52 265-301



### Plug

Venting

Article No
52 265-302



### Transition nipple

For capillary pipe with G1/16 connection.

d	Article No
G1/2	52 179-981
G3/4	52 179-986

