STAP

Differential pressure controllers
DN 15-50

Engineering
GREAT Solutions

IMI Hydronic Engineering

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.

> **Adjustable set-point and shut-off function**
Delivers desired differential pressure ensuring accurate balancing. Shut-off function makes maintenance easy and straightforward.

> **Measuring points with drain option**
Simplifies the balancing procedure, and increases its accuracy.

Technical description

Application:
Heating and cooling systems.

Functions:
Differential pressure control
Adjustable Δp
Measuring point
Shut-off
Draining (accessory)

Dimensions:
DN 15-50

Pressure class:
PN 16

Max. differential pressure (ΔpV):
250 kPa

Setting range:
DN 15 - 20: 5* - 25 kPa
DN 32 - 40: 10* - 40 kPa
DN 15 - 25: 10* - 60 kPa
DN 32 - 50: 20* - 80 kPa
*) Delivery setting

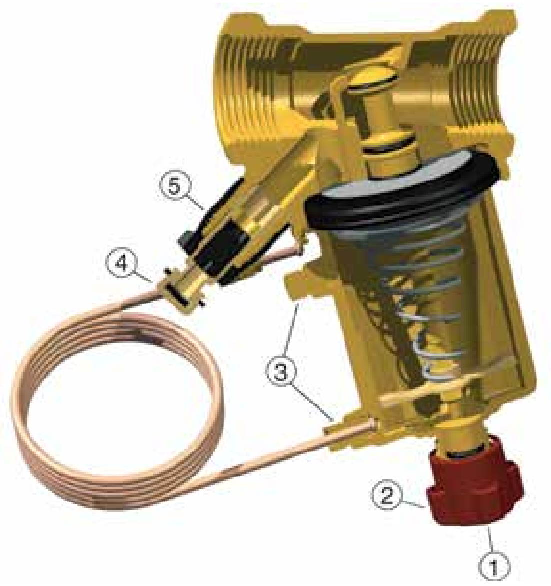
Temperature:
Max. working temperature: 120°C
Min. working temperature: -20°C

Material:
Valve body: AMETAL®
Bonnet: AMETAL®
Cone: AMETAL®
Spindles: AMETAL®
O-rings: EPDM rubber
Membrane: HNBR rubber
Spring: Stainless steel
Handwheel: Polyamide
Smooth ends:
Nipple: AMETAL®
Sealing (DN 25-50): EPDM O-ring

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

Marking:
Body: TA, PN 16/150, DN, inch size and flow direction arrow.
Bonnet: STAP, Δp_L 5-25, 10-40, 10-60 or 20-80.

Operating instruction



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

Drain

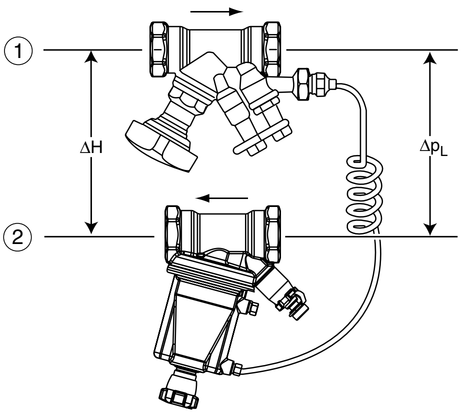
Draining kit available as accessory. Can be connected during operation.

Installation

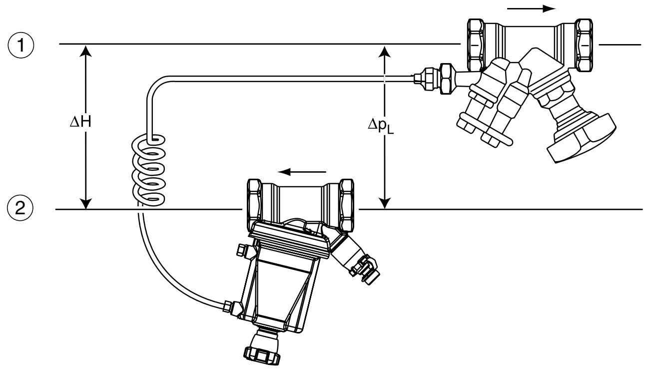
Note! The STAP must be placed in the return pipe and with correct flow direction.
To simplify installations in tight spaces, the bonnet can be detached.

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

Balancing of system **with** presettable valves.
(Suitable for Application examples 1, 3, 4 and 5)



Balancing of system **with non** presettable valves.
(Suitable for Application example 2)

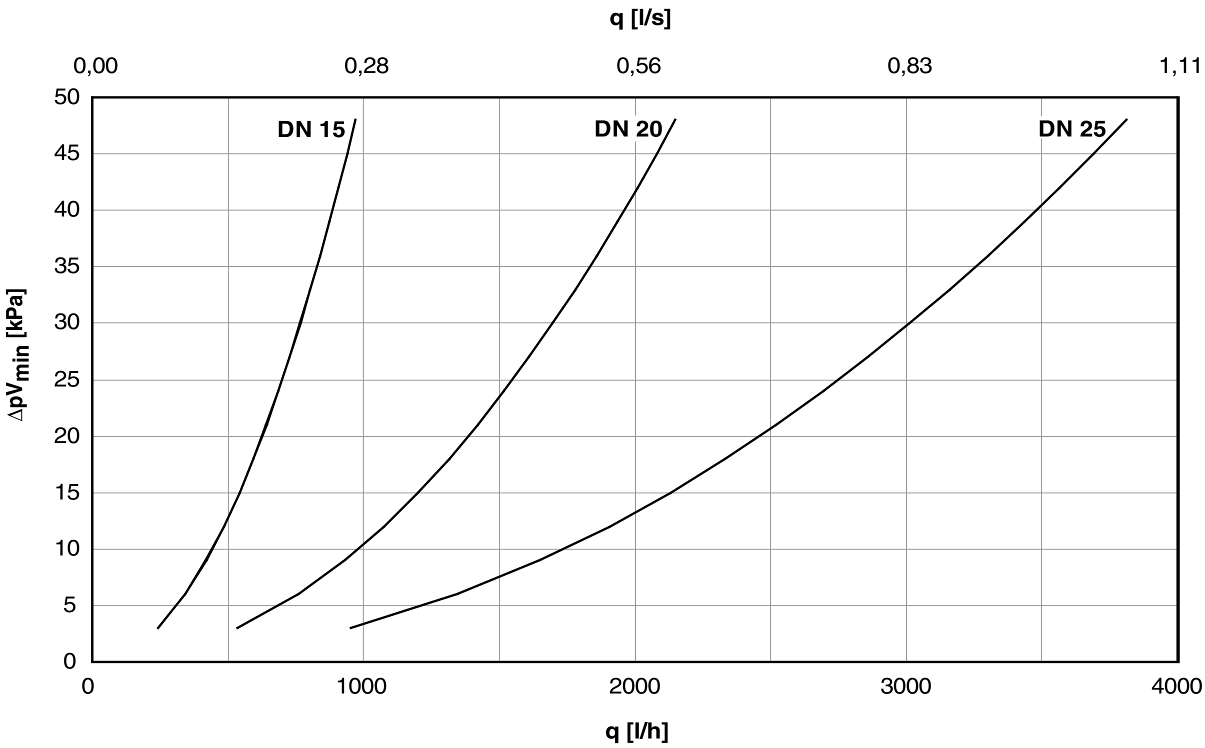


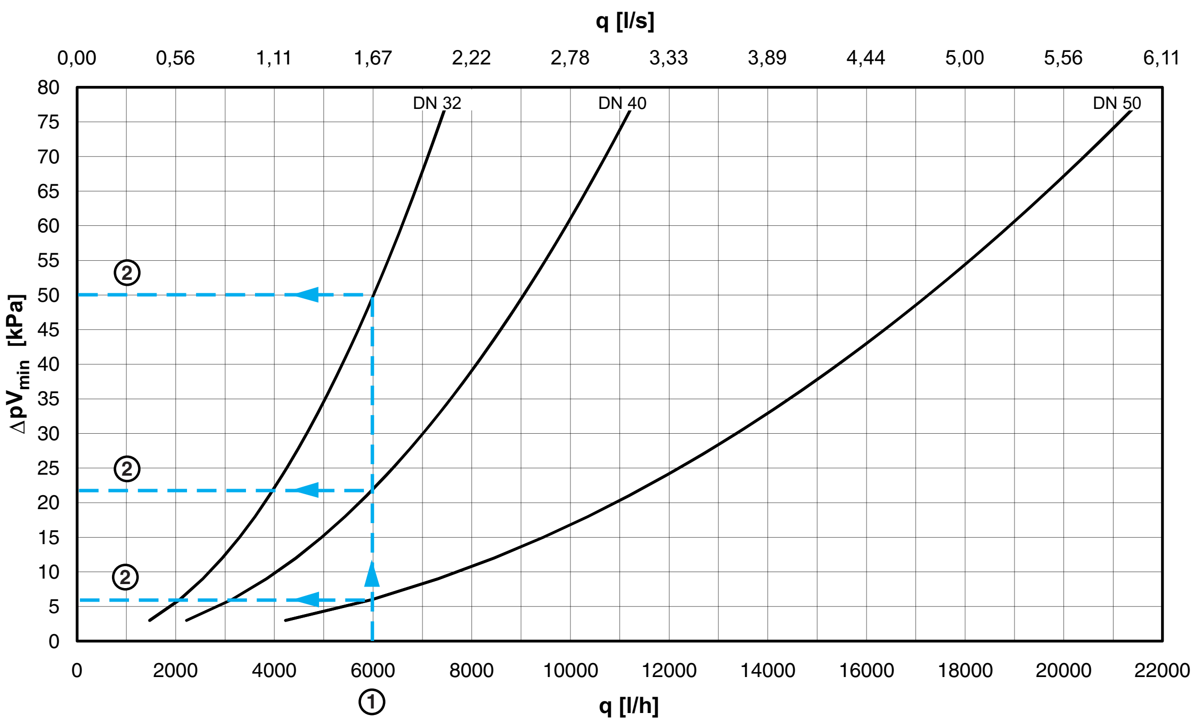
1. Inlet
2. Return

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

Diagram

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





Example:
Desired flow 6000 l/h, Δp_L = 23 kPa and available differential pressure ΔH = 60 kPa.

1. Desired flow (q) 6000 l/h.

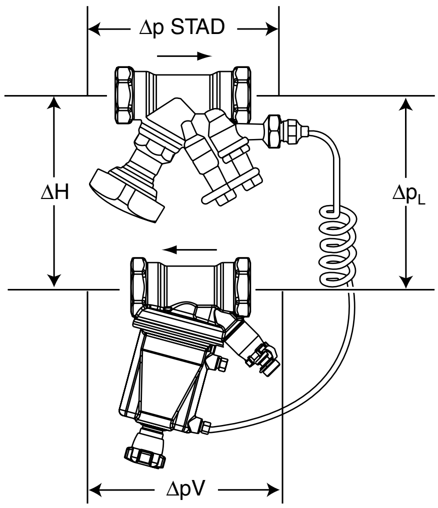
2. Read the pressure drop ΔpV_{min}
DN 32 ΔpV_{min} = 50 kPa
DN 40 ΔpV_{min} = 22 kPa
DN 50 ΔpV_{min} = 6 kPa

3. Calculate required available differential pressure ΔH_{min}.
At 6000 l/h and fully open STAD the pressure drop is, DN 32 = 18 kPa, DN 40 = 10 kPa and DN 50 = 3 kPa.

$\Delta H_{min} = \Delta p\ STAD + \Delta p_L + \Delta pV_{min}$

DN 32: ΔH_{min} = 18 + 23 + 50 = 91 kPa
DN 40: ΔH_{min} = 10 + 23 + 22 = 55 kPa
DN 50: ΔH_{min} = 3 + 23 + 6 = 32 kPa

4. 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 ΔH_{min} = 91 kPa and available differential pressure 60 kPa only).



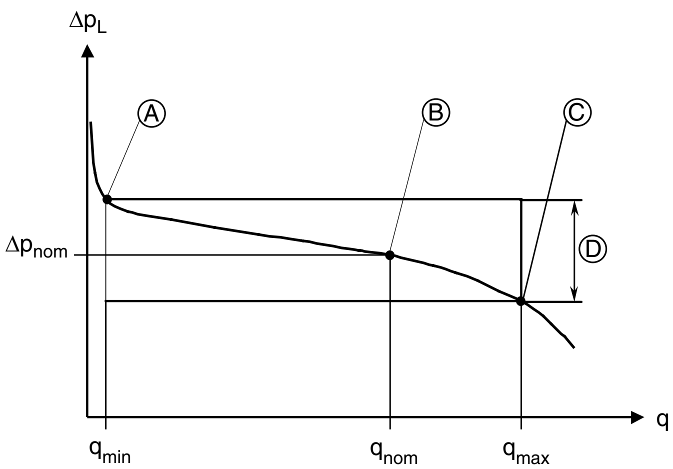
$\Delta H = \Delta p\ STAD + \Delta p_L + \Delta pV$

IMI Hydronic Engineering recommends the software TA Select for calculating the STAP size. TA Select can be downloaded from www.imi-hydronic.com.

Working range

	Kv_{min}	Kv_{nom}	Kv_m
DN 15	0,07	1,0	1,4
DN 20	0,16	2,2	3,1
DN 25	0,28	3,8	5,5
DN 32	0,42	6,0	8,5
DN 40	0,64	9,0	12,8
DN 50	1,2	17,0	24,4

Note! The flow in the circuit is determined by its resistance, i.e. Kv_C: $q_C = Kv_C \sqrt{\Delta p_L}$



A. Kv_{min}
B. Kv_{nom} (Delivery setting)
C. Kv_m
D. Working range Δp_L ±20%. STAP 5-25 and 10-40 kPa ±25%.

Sizing

1. Select the desired Δp_L in the tables.
2. Select the same size of the valve as the pipe.
3. Check that the desired flow is smaller than the specified q_{max}. If not, select the nearest bigger dimension, alternatively a bigger Δp_L.

The tables are valid for:
$\Delta H \geq 2 \times \Delta p_L$, but the valve works properly between $\Delta H \sim 1{,}5 \times \Delta p_L$ to 250 kPa + Δp_L.

5-25 kPa

q [l/h]

DN	Δp_L [kPa] 5			10			15			20			25		
	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}
15	15	220	310	20	320	440	25	390	540	30	450	630	35	500	700
20	35	490	690	50	700	980	60	850	1200	70	980	1390	80	1100	1550

10-40 kPa

q [l/h]

DN	Δp_L [kPa] 10			20			30			40		
	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}
32	130	1900	2690	190	2680	3800	230	3290	4660	270	3790	5380
40	200	2850	4050	290	4020	5720	350	4930	7010	400	5690	8100

10-60 kPa

q [l/h]

DN	Δp_L [kPa] 10			20			30		
	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}
15	20	320	440	30	450	630	40	550	770
20	50	700	980	70	980	1390	90	1200	1700
25	90	1200	1740	130	1700	2460	150	2080	3010

q [l/h]

DN	Δp_L [kPa] 40			50			60		
	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}
15	45	600	900	50	710	990	55	770	1080
20	100	1400	2000	110	1560	2190	120	1700	2400
25	180	2400	3500	200	2690	3890	220	2940	4260

20-80 kPa

q [l/h]

DN	Δp_L [kPa] 20			30			40			50		
	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}
32	190	2680	3800	230	3290	4660	270	3790	5380	300	4240	6010
40	290	4020	5720	350	4930	7010	400	5690	8100	450	6360	9050
50	540	7600	10900	660	9310	13400	760	10800	15400	850	12000	17300

q [l/h]

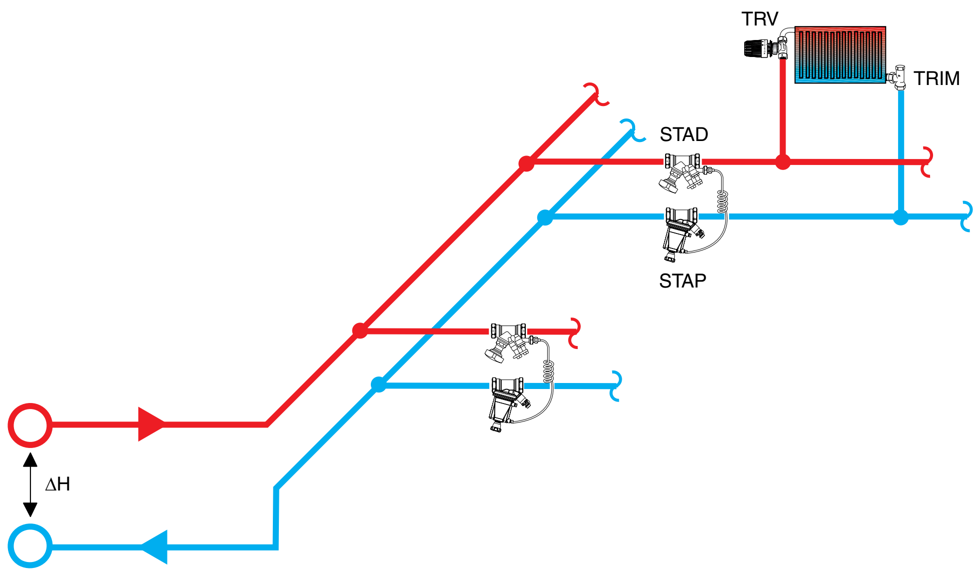
DN	Δp_L [kPa] 60			70			80		
	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}	q_{min}	q_{nom}	q_{max}
32	330	4650	6580	350	5020	7110	380	5370	7600
40	500	6970	9910	540	7530	10700	570	8050	11400
50	930	13200	18900	1000	14200	20400	1070	15200	21800

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 Δp_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.

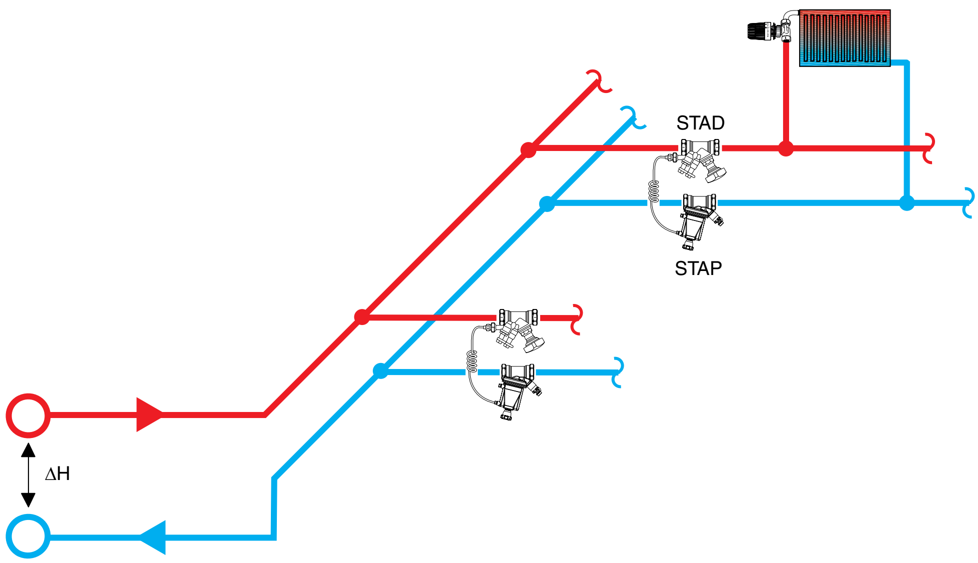


2. Stabilising the differential pressure across a circuit with non-presettable radiator valves

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.

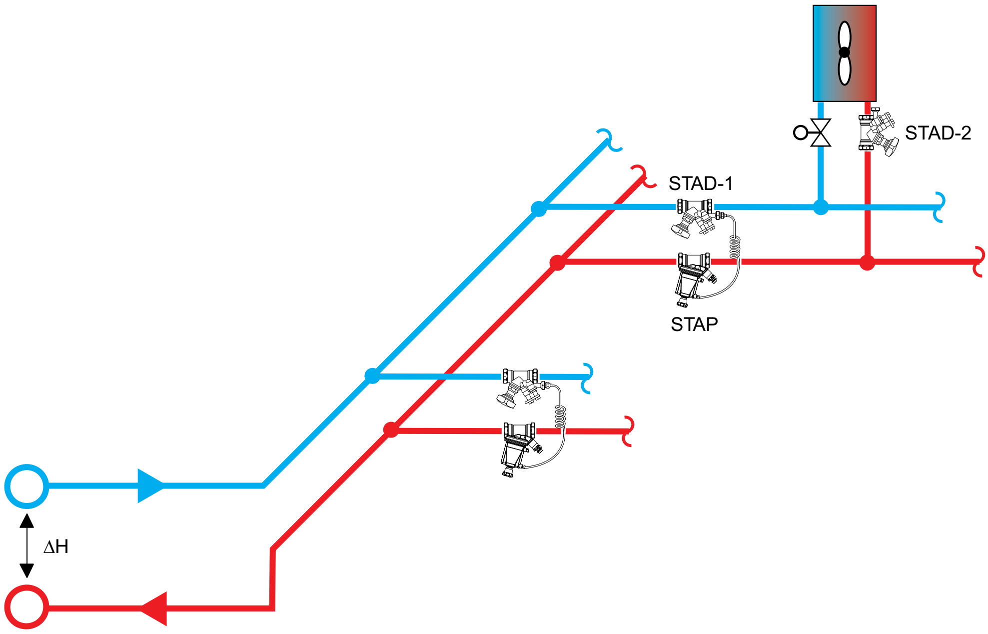
- STAP stabilises Δp_L.
- There is no presettable Kv-value on the radiator valve in order to limit the flow in each radiator.
- STAD limits the total flow in the circuit.



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.

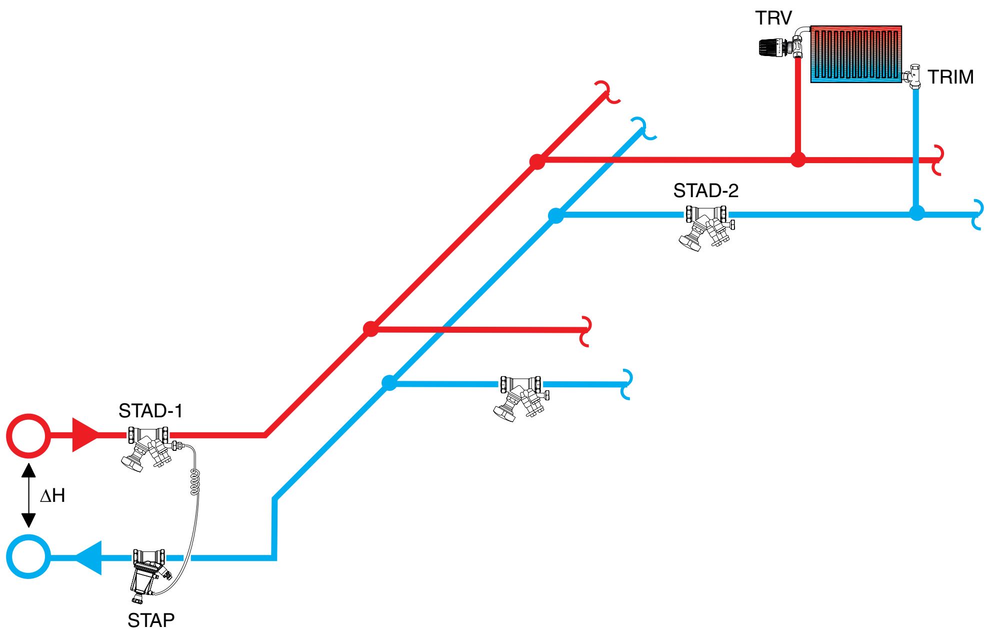
- STAP stabilises Δp_L.
- The set Kv-value in STAD-2 limits the flow in each terminal unit.
- STAD-1 is used for flow measuring, shut-off and connection of the capillary pipe.



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 ΔH to a suitable and stable Δp_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.

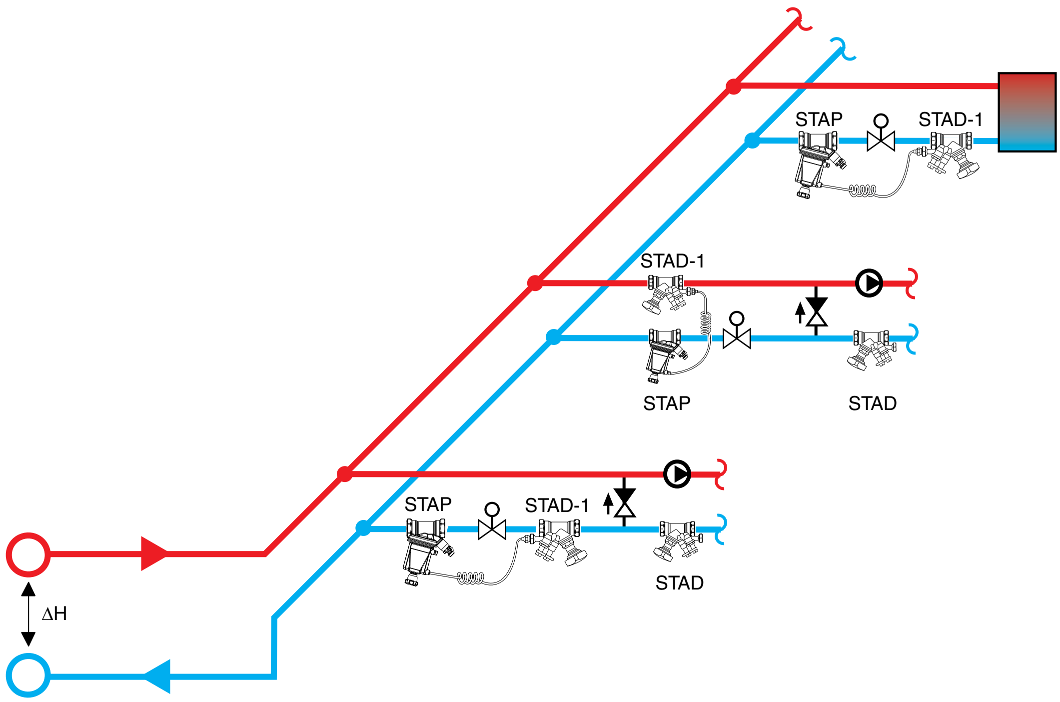


5. Keeping the differential pressure across a control valve constant

Depending of 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 Δp across the control valve constant, giving a valve authority ~ 1.
- The Kvs of the control valve and the chosen Δp gives the design flow.
- STAD-1 is used for flow measuring, shut-off and connection of the capillary pipe.

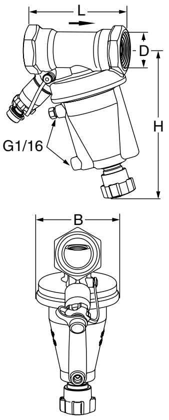


Sizing the control valve

A control valve should give a flow of 1000 l/h at a ΔH 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 Δp 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 Δp above the minimum set point of STAP (i.e. 5, 10 or 20 kPa depending on size and type).
- Adjust STAP to give Δp_L = 16 kPa. Check the flow with TA's balancing instrument over STAD-1 and with the control valve fully open.

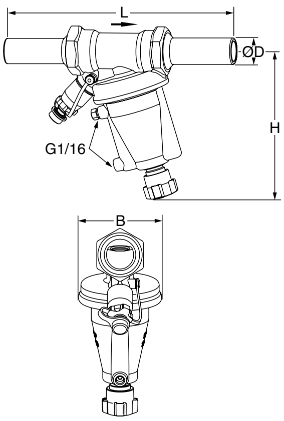
Articles



Female threads

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

DN	D	L	H	B	Kv_m	Kg	EAN	Article No
5-25 kPa								
15*	G1/2	84	137	72	1,4	1,1	7318793946607	52 265-115
20*	G3/4	91	139	72	3,1	1,2	7318793946706	52 265-120
10-40 kPa								
32	G1 1/4	133	179	110	8,5	2,6	7318793790002	52 265-132
40	G1 1/2	135	181	110	12,8	2,9	7318793790101	52 265-140
10-60 kPa								
15*	G1/2	84	137	72	1,4	1,1	7318793623201	52 265-015
20*	G3/4	91	139	72	3,1	1,2	7318793623300	52 265-020
25	G1	93	141	72	5,5	1,3	7318793623409	52 265-025
15	Rc1/2	84	137	72	1,4	1,1	7318793958501	52 266-315
20	Rc3/4	91	139	72	3,1	1,2	7318793958600	52 266-320
25	Rc1	93	141	72	5,5	1,3	7318793958709	52 266-325
20-80 kPa								
32	G1 1/4	133	179	110	8,5	2,6	7318793623805	52 265-032
40	G1 1/2	135	181	110	12,8	2,9	7318793623904	52 265-040
50	G2	137	187	110	24,4	3,5	7318793624000	52 265-050
32	Rc1 1/4	133	179	110	8,5	2,6	7318793958808	52 266-332
40	Rc1 1/2	135	181	110	12,8	2,9	7318793958907	52 266-340
50	Rc2	137	187	110	24,4	3,5	7318793959003	52 266-350



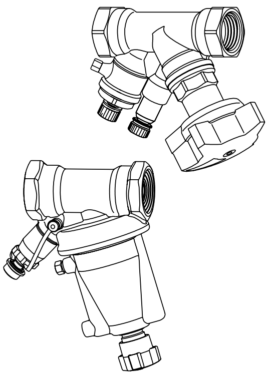
Smooth ends

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

DN	D	L	H	B	Kv_m	Kg	EAN	Article No
5-25 kPa								
15	15	148	137	72	1,4	1,2	7318793949905	52 465-115
20	22	173	139	72	3,1	1,4	7318793950000	52 465-120
10-40 kPa								
32	35	242	179	110	8,5	3,0	7318793935304	52 465-132
40	42	265	181	110	12,8	3,4	7318793935403	52 465-140
10-60 kPa								
15	15	148	137	72	1,4	1,2	7318793934703	52 465-015
20	22	173	139	72	3,1	1,4	7318793934802	52 465-020
25	28	191	141	72	5,5	1,6	7318793934901	52 465-025
20-80 kPa								
32	35	242	179	110	8,5	3,0	7318793935007	52 465-032
40	42	265	181	110	12,8	3,4	7318793935106	52 465-040
50	54	287	187	110	24,4	4,3	7318793935205	52 465-050

→ = Flow direction
Kv_m = m^3/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.
Rc = Thread according to ISO 7 (≈ BS 21).

STAP/STAD

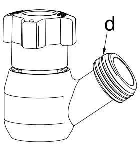


STAP/STAD package

For more information on STAD see separate catalogue leaflet

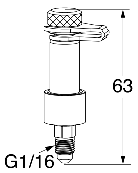
STAP DN	STAD DN	EAN	Article No
5-25 kPa			
15	15	7318793974303	52 265-101
20	20	7318793974402	52 265-102
10-40 kPa			
32	32	7318793974501	52 265-103
40	40	7318793974600	52 265-104
10-60 kPa			
15	10	7318793974709	52 265-001
15	15	7318793974808	52 265-002
20	20	7318793974907	52 265-003
25	25	7318793975003	52 265-004
20-80 kPa			
32	32	7318793975102	52 265-005
40	40	7318793975201	52 265-006
50	50	7318793975706	52 265-007

Accessories



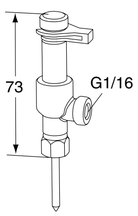
Draining kit STAP

d	EAN	Article No
G1/2	7318793660404	52 265-201
G3/4	7318793660503	52 265-202



Measuring point STAP

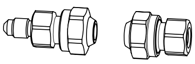
EAN	Article No
7318793660602	52 265-205



Measuring point, two-way

For connection of capillary pipe while permitting simultaneous use of TA's balancing instrument.

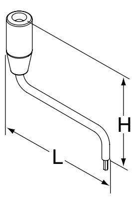
EAN	Article No
7318793784100	52 179-200



Extension kit for capillary pipe

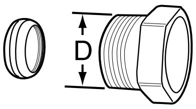
Complete with connections for 6 mm pipe

EAN	Article No
7318793781505	52 265-212



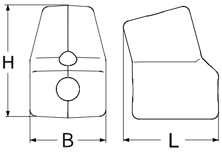
Setting tool Δp_L

L	H		EAN	Article No
107	85	3 mm	7318793975508	52 265-305



Compression connection KOMBI
See catalogue leaflet KOMBI.

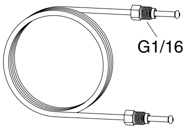
D	Pipe Ø	EAN	Article No
G1/2	10	7318792874901	53 235-109
G1/2	12	7318792875007	53 235-111
G1/2	14	7318792875106	53 235-112
G1/2	15	7318792875205	53 235-113
G1/2	16	7318792875304	53 235-114
G3/4	15	7318792875403	53 235-117
G3/4	18	7318792875601	53 235-121
G3/4	22	7318792875700	53 235-123



Insulation STAP
For heating/cooling

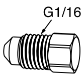
For DN	L	H	B	EAN	Article No
15-25	145	172	116	7318793658906	52 265-225
32-50	191	234	154	7318793659002	52 265-250

Spare parts



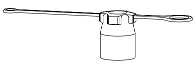
Capillary pipe

L	EAN	Article No
1 m	7318793661500	52 265-301



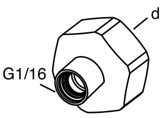
Plug
Venting

EAN	Article No
7318793661609	52 265-302



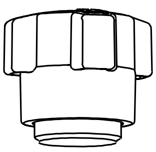
Protective cap
Draining

EAN	Article No
7318793661708	52 265-303



Transition nipple

d	EAN	Article No
G1/2	7318793660206	52 179-981
G3/4	7318793660305	52 179-986



Handwheel

	EAN	Article No
DN 15-25	7318793952202	52 265-900
DN 32-50	7318793952301	52 265-901