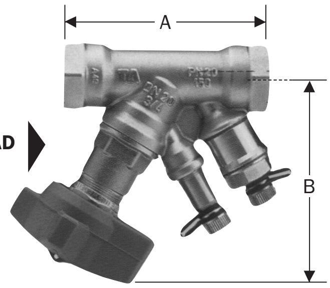
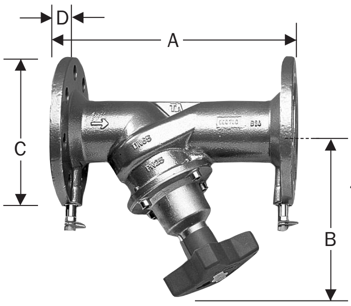
Balancing Valves



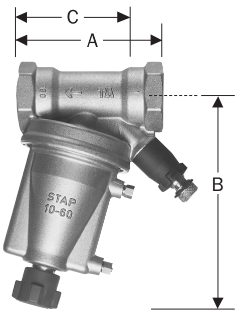
STAD



STAF
STAF-SG

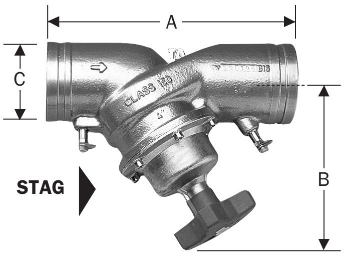
STA-DR (15, 20 and 25mm only)

		STAD WITH DIGITAL HANDWHEEL							STAF or STAF-SG					STAF		
SIZE (mm)		10/09	15/14	20	25	32	40	50	65	80	100	125	150	200	250	300
DIMENSIONS	A	83	90	97	110	124	130	155	290	310	350	400	480	600	730	850
	B	100	100	100	105	110	120	120	205	220	240	275	285	420	430	480
	C	-	-	-	-	-	-	-	185	200	220	250	285	360	425	485
	D	-	-	-	-	-	-	-	20	22	22	24	24	30	32	32
WEIGHT (kg)		0.622	0.66	0.71	0.9	1.1	1.5	2.2	12.4	15.9	21.6	32.7	44.3	77.5	122	173
CONNECTIONS		THREADS TO AS 1722.2 (ISO 228-1)							FLANGED ENDS PN16/PN25 TO ISO 7005.2							
MAX. WORKING PRESSURE (kPa)		(2000) PN20							(1600) PN16				((2500) PN250STAF-SG ONLY)			
MAX. OPERATING TEMPERATURE		-20ºC to 120ºC (250ºF) CONTINUOUS							-10ºC to 120ºC				(-20ºC to 120ºC*-STAF-SG ONLY)			
MATERIAL OF CONSTRUCTION		AMETAL, COPPER ALLOY TO BS 5154 ALLOY B.							CAST IRON, AMETAL TRIM (DUCTILE IRON STAF-SG ONLY)							
SEATING		EPDM							EPDM					EPDM		
SURFACE FINISH									EPOXY RESIN COATED					TWO PACK ENAMEL		
INSULATION (FOR HEATING OR COOLING)		POLYURETHANE – 35ºC to 120ºC (-22ºF to 250ºF)												NOT AVAILABLE		
HANDWHEEL NUMBER OF TURNS		4							8					12		16



1m capillary pipe and transition nipples 1/2” and 3/4” are included.

STAP



STAG

		STAP DIFFERENTIAL PRESSURE CONTROLLER							STAG GROOVED ENDS							
SIZE (mm)			15	20	25	32	40	50	65	80	100	125	150	200	250	300
DIMENSIONS	A		84	91	93	133	135	137	290	310	350	400	480	600	730	850
	B		137	139	141	179	181	187	205	220	240	275	285	430	420	480
	C		72	72	72	110	110	110	76.1	88.9	114.3	141.3	168.3	219.1	273	323.9
WEIGHT (kg)									6.4	9.1	14	22.7	31.3	63.5	92	127
CONNECTIONS		THREADS TO AS 1722.2 (ISO 228-1)							GROOVED TO ISO 4200							
MAX. WORKING PRESSURE (kPa)		(1600) PN16							(2500) PN25							
MAX. OPERATING TEMPERATURE		-20ºC to 120ºC (250ºF) CONTINUOUS							-20ºC to 120ºC							
MATERIAL OF CONSTRUCTION		AMETAL BRONZE COPPER ALLOY							DUCTILE IRON ISO 1083 GRADE X							
SEATING		EPDM							EPDM					EPDM		
SURFACE FINISH									EPOXY RESIN COATED					TWO PACK ENAMEL		
INSULATION (FOR HEATING OR COOLING)		POLYURETHANE – 35ºC to 120ºC (-22ºF to 250ºF)												NOT AVAILABLE		
HANDWHEEL NUMBER OF TURNS		–							8					12		16

STAF Balancing Valves are also available 20mm to 50mm. Technical information is available on request.
Each valve is tested for leakage before delivery.
STA-DR – Reduced bore STAD balancing valve, available in sizes 15, 20 and 25mm (bore size) with smaller seat area.
STAF-SG – Manufactured from Ductile Iron. *Higher temperatures available on request.
STAP - EPDM rubber diaphragm (membrane).
STA - Double regulating valve (STAD without test points).

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Balancing Valves

Sizing a Balancing Valve

1. When Δp and design flow are known, select the valve to obtain this Δp for an opening around 75%.

2. When flow is known and the Δp unknown, select the valve for a Δp between 3 and 6 kPa in fully open position (see table below).

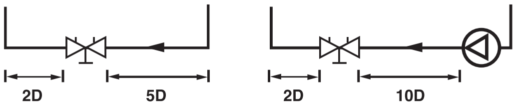
Size mm (D/N)	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300
Normal flow l/s	0.05 0.17	0.28	0.4	0.6	0.8	1.4	3	5	8	15	20	35	55	80	120
Max flow l/s*	0.23	0.4	0.6	1	1.5	2	4	10	15	20	35	50	80	130	175

•Maximum flow is calculated for the valve fully open and Δp =16 kPa

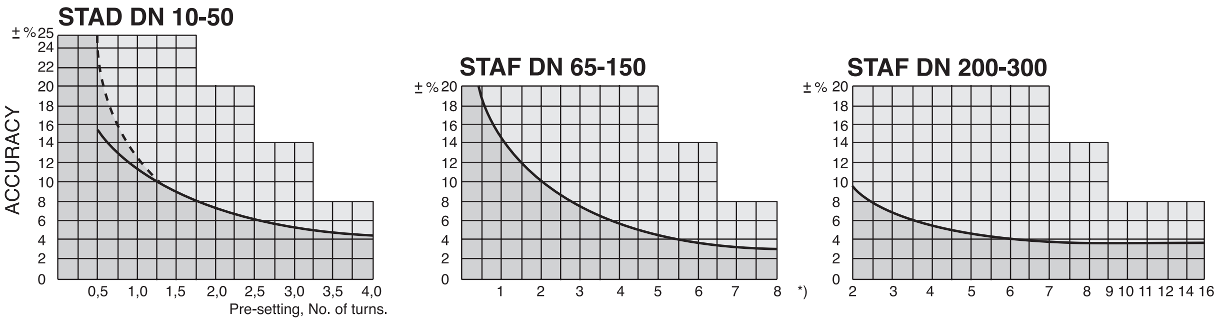
Measuring accuracy

A valve that operates with a high level of flow capacity naturally has a large cross-section area when the valve is fully open. The valve seat and cone dimensions are manufactured within tolerances. Flow accuracy is the highest when the valve is fully open. The smaller the valve opening the greater the importance of the manufacturing tolerances.

The curves below indicate the number of turns of the handwheel and the percentage accuracy, based on the recommended straight length of the pipe up and down stream of the valve.
The influence of turbulence if our recommendations are not adhered to can influence the flow up to 20%.



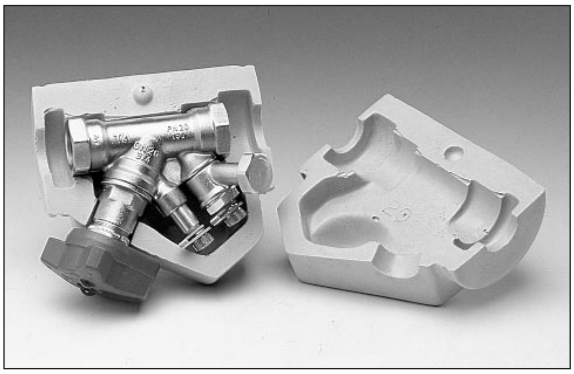
Flow deviation for different pre-settings



Snap-on insulation

Leaving a valve without insulation leads to unnecessary heat loss in heating systems and condensation in cooling systems. That's why proper insulation quickly pays dividends.

Prefabricated insulation is available, you just snap on the insulation pieces using two lock-rings, and in no time at all your valve is perfectly insulated. In contrast to ordinary insulation you save considerable amounts of time and you can get at the valve whenever you want without the messy job of tearing off and replacing the insulation.



Snap on insulation saves time and money.

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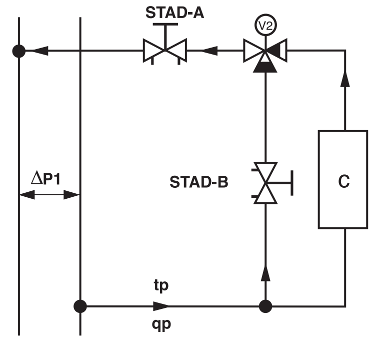
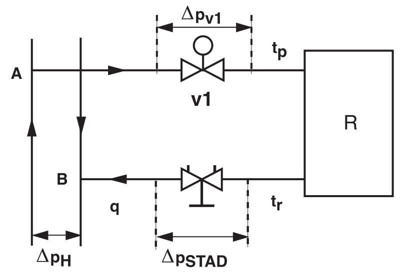
Balancing Valves

Example of applications

Diagram	Water flows: Primary	Water flows: Secondary	Control valve Authority >0.4	Δp STAD-A for qp	Δp STAD-B	qpd/qsd
	Constant	Variable	$\frac{\Delta p\ V2}{\Delta p\ V2 + \Delta PC}$	ΔP1-ΔPV2-ΔPC	ΔPC	1
	Variable	Variable	$\frac{\Delta pV1}{\Delta P1}$		$\frac{\Delta p\ STAD\text{-}1}{\Delta P1\text{-}\Delta PV1\text{-}\Delta PC}$	1

It's a bypass circuit. When the three way valve is a mixing valve, it must be put in the return to obtain two inputs and one output, since a mixing valve is designed for that. Balancing valve STAD-A is essential to adjust the constant flow at the right value. Balancing valve STAD-B has to create the same pressure drop in the bypass, for design flow, as in the coil.

To obtain the design flow for the control valve fully open, the surplus differential pressure is taken by the balancing value. However, the authority ΔPV1/ΔP1 must be greater than 0.4 to obtain a good control.

Flow coefficient values (Kv's)

When calculating and dimensioning pipe system, the following values for valve resistance can be used. In calculating work they provide the actual capacity of the valve since the pressure drop is based on measurements at the feed outlet at such a distance from the valve that turbulence inside the valve itself does not influence the values.

DN / Turns	STAD 10/09	STAD 15/14	STAD 20	STAD 25	STAD 32	STAD 40	STAD 50	STAF & STAF-SG 65/2	80	100	125	150	200	250	300
0.5	0.048	0.127	0.511	0.60	1.14	1.75	2.56	1.8	2	2.5	5.5	6.5	–	–	–
1	0.090	0.212	0.757	1.03	1.90	3.30	4.20	3.4	4	6	10.5	12	–	–	–
1.5	0.137	0.314	1.19	2.10	3.10	4.60	7.20	4.9	6	9	15.5	22	–	–	–
2	0.260	0.571	1.90	3.62	4.66	6.10	11.7	6.5	8	11.5	21.5	40	40	90	–
2.5	0.480	0.877	2.80	5.30	7.10	8.80	16.2	9.3	11	16	27	65	50	110	–
3	0.826	1.38	3.87	6.90	9.50	12.6	21.5	16.3	14	26	36	100	65	140	150
3.5	1.26	1.98	4.75	8.00	11.8	16.0	26.5	25.6	19.5	44	55	135	90	195	230
4	1.47	2.52	5.70	8.70	14.2	19.2	33.0	35.3	29	63	83	169	120	255	300
4.5	–	–	–	–	–	–	–	44.5	41	80	114	207	165	320	370
5	–	–	–	–	–	–	–	52	55	98	141	242	225	385	450
5.5	–	–	–	–	–	–	–	60.5	68	115	167	279	285	445	535
6	–	–	–	–	–	–	–	68	80	132	197	312	340	500	620
6.5	–	–	–	–	–	–	–	73	92	145	220	340	400	545	690
7	–	–	–	–	–	–	–	77	103	159	249	367	435	590	750
7.5	–	–	–	–	–	–	–	80.5	113	175	276	391	470	660	815
8	–	–	–	–	–	–	–	85	120	190	300	420	515	725	890
9	–	–	–	–	–	–	–	–	–	–	–	–	595	820	970
10	–	–	–	–	–	–	–	–	–	–	–	–	650	940	1040
11	–	–	–	–	–	–	–	–	–	–	–	–	710	1050	1120
12	–	–	–	–	–	–	–	–	–	–	–	–	765	1185	1200
13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1320
14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1370
15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1400
16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1450

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CBI^{II}

Balancing Instrument

Technical description

CBI^{II} is a third generation computer programmed balancing instrument. It consists of an electronic differential pressure gauge and a micro computer which has been programmed with the TA valve characteristics which makes possible a direct reading of flow and differential pressures.

The CBI^{II} has two main components:

- An instrument which contains a micro computer, input touch pad, LCD display and re-chargeable NiMh batteries.
- A sensor unit which contains a piezo-resistive pressure sensor, one measurement valve and connections. The measurement valve has a safety function which protects the sensor from too high differential pressures.

Guarantee: Five years

Supplied with case, manual, software and accessories.

Measurement range
Total pressure: max 2 500 kPa.
Differential pressure: -9 to 200 kPa.
Flow: During flow measurements the pressure range is 0.5 to 200 kPA.
Temperature: -20 to 120ºC

Temperature liquid medium: -20 to 120ºC

Measurement deviation
Differential pressure: 0.2 kPa or 1% of reading, whichever is the highest.
Flow: As for differential pressure + value deviation.
Temperature: <0.2ºC + sensors' deviation.

Effective operating time
8 to 10 h between charges depending upon application.

Ambient temperature for the instrument
0 to 40ºC (during operation)
-20* to 60ºC (storage)
5 to 40ºC (charging)
* Do not leave water in the sensor when there is a risk of freezing.

Function

Differential pressure measurement
Sensor for high total pressures and low differential pressures gives quick results and reliable readings.

Temperature measurements
A Pt 1000 temperature sensor which allows measurement direct in the media is included.

Automatic calibration
When the sensor is connected and the instrument switched on, the sensor is automatically calibrated before each measurement sequence.

Automatic venting
The design of the sensor unit and a short flow-through during calibration eliminate measurement errors caused by insufficient venting.

Balancing
The instrument is programmed to calculate pre-setting values for balancing and also the TA Method and TA Balance.

PC communication
Measured values can be saved in the CBI^{II} and then transferred to a PC for printout as a commissioning report. It is also possible to prepare the measurements by describing the system, in plain language, in the PC and then download the data to the CBI^{II}. A PC program is included for this purpose.

Media correction
CBI^{II} can calculate flows with different contents of glycol or similar anti-freeze additives in the water.

Trouble shooting
CBI^{II} can log differential pressures, flows or temperatures: up to 24 000 measured values can be logged. With appropriate choice of logging interval, this means that periods from 20 hours to 65 days can be covered.

Balancing

See the following manuals for descriptions of various adjustment methods:

Manual no. 1: Balancing control circuits
Manual no. 2: Balancing distribution systems
Manual no. 3: Balancing radiator system
Manual no. 4: Stabilising differential pressure

Total hydronic balancing

TA Balance
This method involves balancing the circuits (the modules) separately. Measure each valve at two settings: the prescribed position, and closed. When all the valves in the module have been measured, the CBI^{II} will calculate the settings and assign a pressure drop of 3 kPa to the least favoured valve.

TA Method
In the TA Method you first choose the valve which is furthest away in the circuit as a reference valve. Using the main valve for this entire circuit, maintain a constant differential pressure during the course of the operation (for example 3 kPa) at the correct flow through the reference valve. Then, set the correct flow rate in the remaining valves in this circuit successively starting with the second furthest valve from the pump.

When all circuits are ready proceed with the main line. When the entire installation is balanced all valves have the correct flow. If it has been necessary to throttle a valve in series with the pump, adjust the pump or change to one with the correct capacity.

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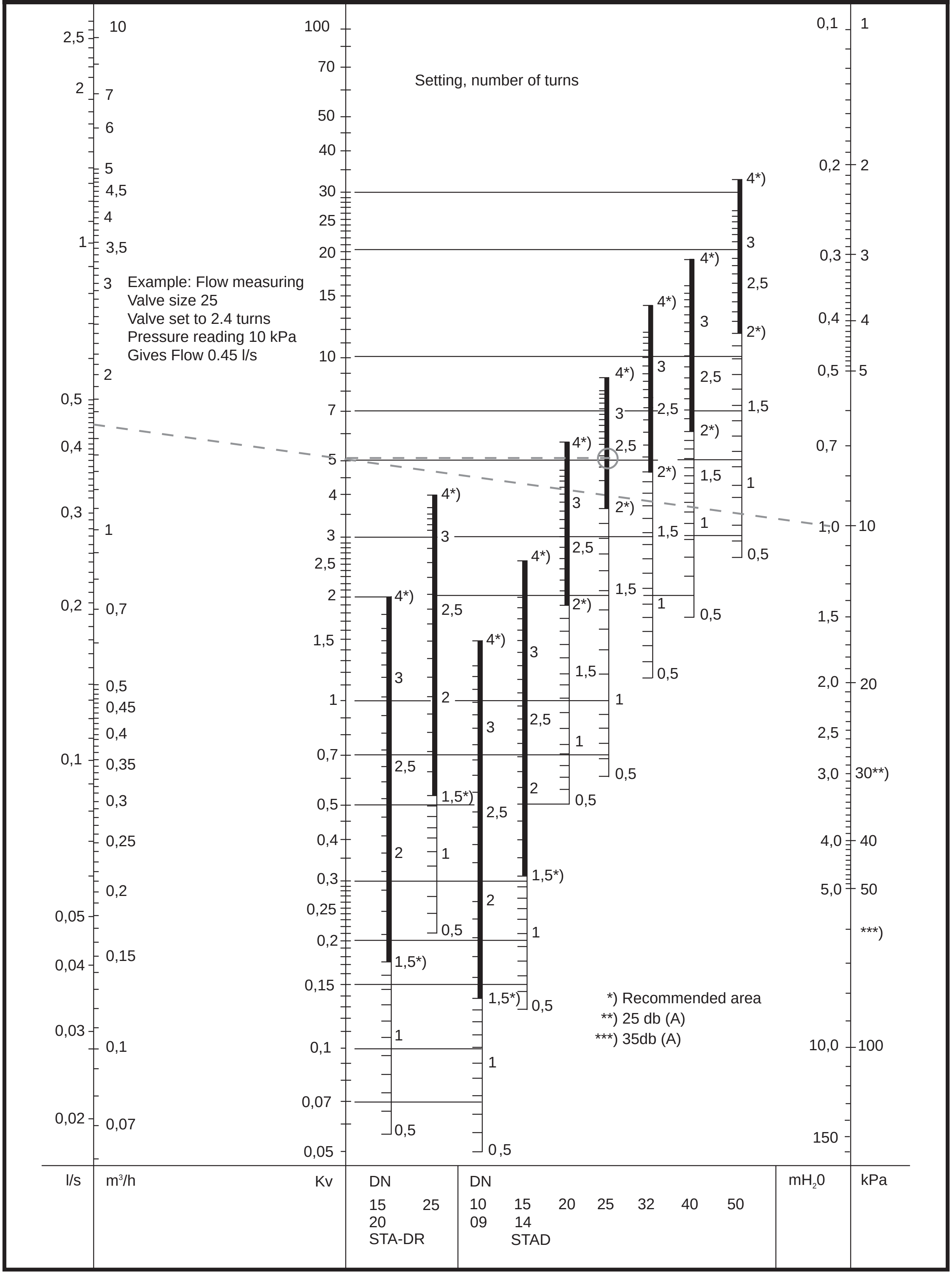
Flow Diagrams

Presetting diagram
STAF sizes 20-50 STAD sizes 10-50 STA-DR sizes 15-25



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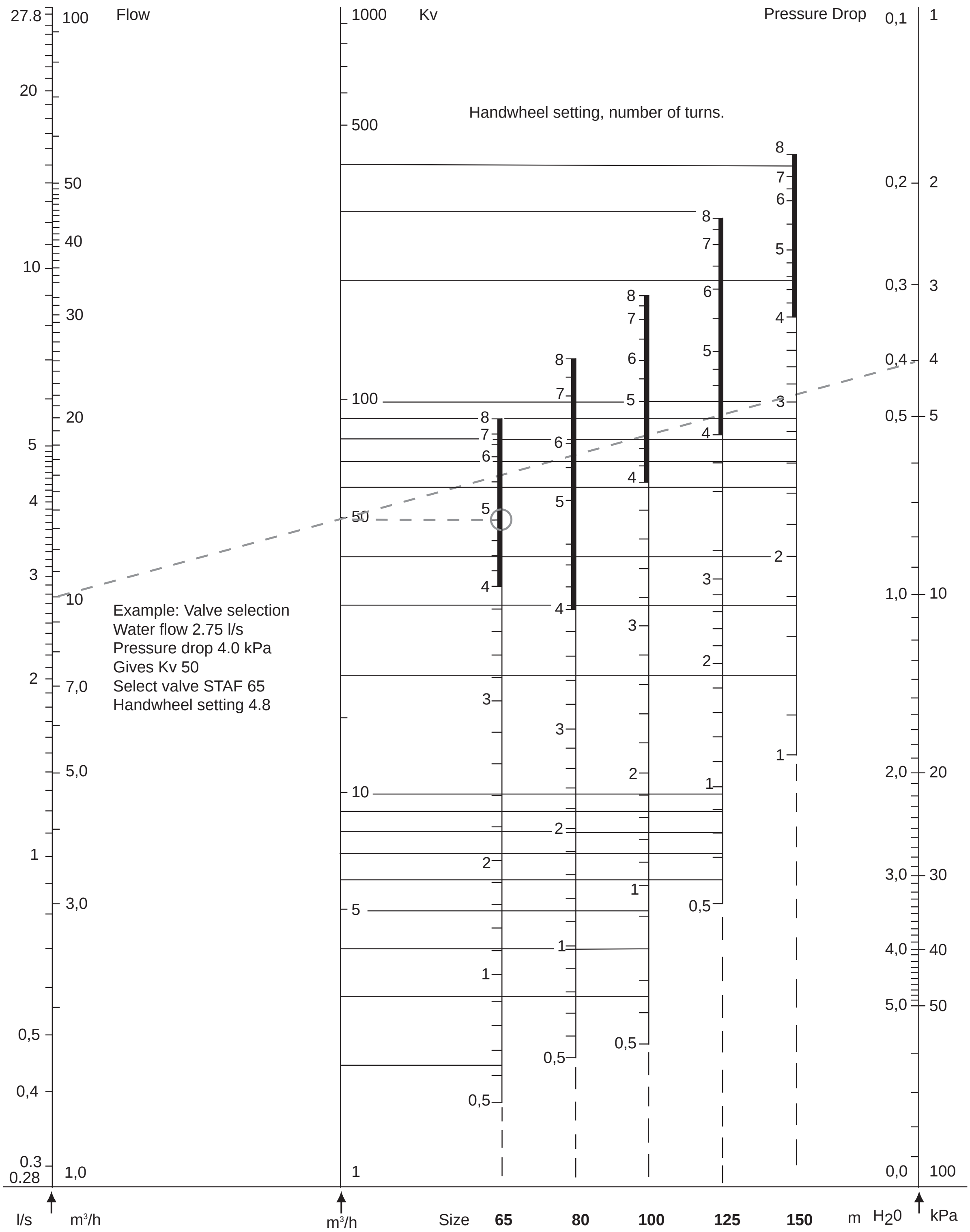
Flow Diagrams

Presetting diagram
STAF/STAG SIZES 65-150



TA retains the right to make changes to its products and specifications without prior notice

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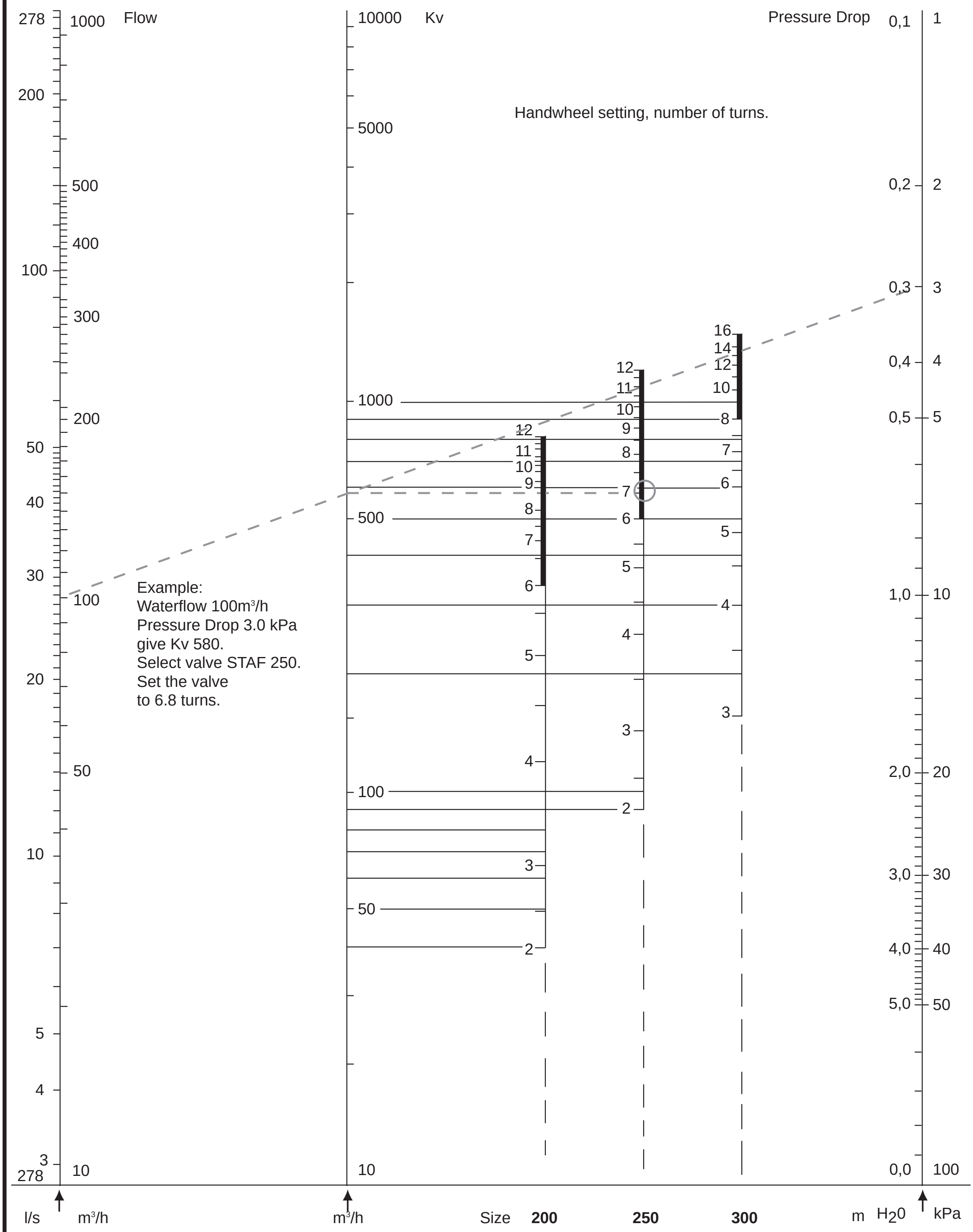
an Indoor Climate business of IMI plc

July 2003

Flow Diagrams

Presetting diagram
STAF SIZES 200-300



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TA Balance Method

The TA Balance Method

The TA Balance Method is a computer program built into the CBI balancing instrument with the same three main advantages of the Compensated Method plus the possibility for one man and one CBI to balance an entire system, faster than before.

There are currently five known methods to balance a hydronic system:

1. TA Balance Method
2. Compensated Method
3. Proportional Method
4. Pre-set Method
5. Temperature Method

The purpose of balancing is to limit the maximum flow in each branch, riser and terminal. It is not always possible to maintain the exact flow through the size of control valve, so the balancing valve brings the controller into working range.

There are specific advantages of the TA Balance Method:

- Reducing labour by adjusting each valve only once
- Reducing pumping costs (up to 8%) by having the lowest admissible pressure drop in the furthest balancing valve.

TA Balance makes it possible to achieve correct flows everywhere with one adjustment at each valve, and without continually compensating with the Partner Valve. TA Balance is based upon the Compensated Method. The program calculates the correct settings of balancing values to obtain design flow, after taking measurements of each one.

The program assumes that the plant can be divided into modules. A module is created of several circuits connected to the same supply and return pipes. Each circuit has its own balancing valve and the module has a common balancing valve, called the Partner Valve.

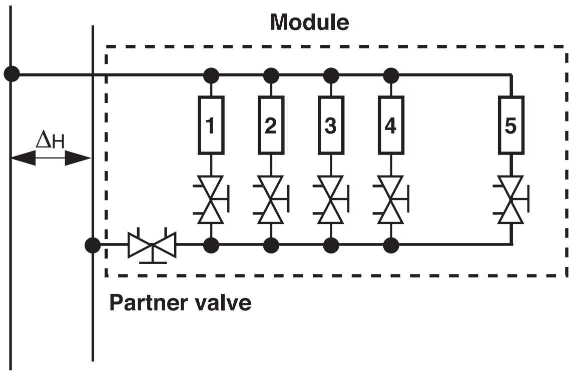

Figure 1
A module is created of several circuits connected to the same supply and return pipes.

1. Preparing the procedure
During the measurements, the differential pressure ΔH, at the inlet of the module, is supposed to be constant. The value of the ΔH is without importance unless it is insufficient to obtain good measurements. For this reason, the risers or modules not yet balanced, which can create big overflows, have to be isolated. To be sure that the pressure drops in the balancing valves will be sufficient to obtain a correct measurement, set the balancing valves on 50% opening (STAD = 2 turns), or at the pre-calculated positions if any. The Partner Valve of the module to be balanced must be fully open during the procedure.

The TA Balance Method demands that the valves be numbered according to figure 1. The first valve after the Partner Valve must be numbered one, with following valves being numbered successively (See Fig. 1). The Partner Valve is not numbered.

2. The procedure
Measure one module at the time. CBI gives directions on the display of each step of the procedure.

For each valve in the module, in any order, the following procedure is applied:

1. Give the reference number, type, size and current position (e.g. 1, STAD, DN20, 2 turns).
2. Give the desired flow.
3. A flow measurement is automatically performed.
4. Shut the valve completely.
5. A differential pressure measurement is automatically performed.
6. Re-open the valve to its original position.
7. When all balancing valves in the module have been measured, CBI requires measuring the Δp across the Partner Valve fully shut.

When this procedure has been carried out, the CBI calculates the correct setting for the balancing valves within the module. Adjust the balancing valves with these settings.

CBI has ‘discovered’ the index circuit (the circuit requiring the highest differential pressure) and has given the concerned balancing valve the minimum pressure drop that is necessary to measure correctly the flow. This value is normally 3 kPa but can be changed if required. The settings of other balancing valves are calculated automatically to obtain a relative balancing of the elements in the module. These settings do not depend on the current differential pressure ΔH applied on the module.

At this moment, the correct flows are not yet achieved. This will happen when the Partner Valve has been adjusted to its correct flow. This operation is carried out later on in the procedure.

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TA Balance Method

3. Balancing the modules of a riser between themselves
When all the modules in one riser have been balanced individually, these modules must be balanced between themselves. Each module is now looked upon as a circuit whose balancing valve is the Partner Valve in the module.

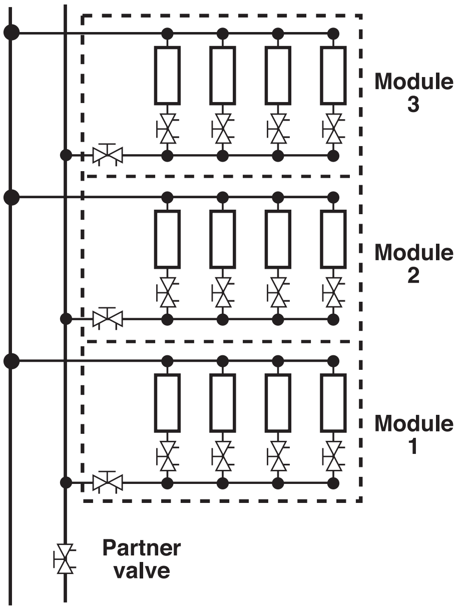

Figure 2
The riser module is created of modules 1, 2 and 3 when these are calculated and set.

The balancing procedure consists of calculating the setting of the Partner Valves of modules 1, 2 and 3 of the riser, using the TA Balance Method. This riser module should now be measured and calculated in the same way as described earlier.

4. Balancing the risers between themselves
When all risers have been balanced individually, they constitute a module. The Partner Valve of this module is the main balancing valve associated with the pump.

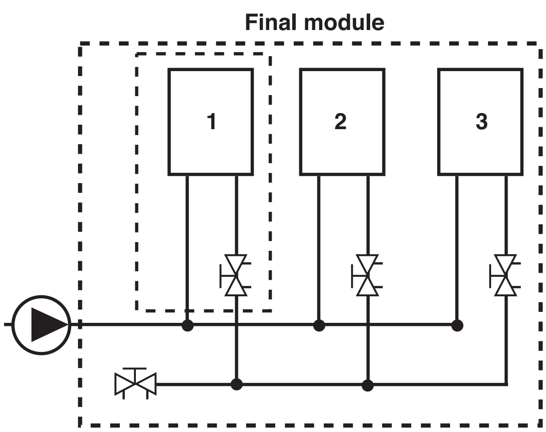

Figure 3
All the risers constitute the final module.

In this new module, the risers are balanced between themselves following the same procedure.

Finally, the total flow is adjusted with the main balancing valve. When this operation is completed, all circuits in the plant will have the desired flows. To verify this, flow measurements can be done on some balancing valves. Printout via a PC provides a list of settings and verified data if these values have been stored.

All the overpressure is located in the main balancing valve. if this overpressure is important, the maximum pump speed can be reduced (variable speed pump), or with a constant speed pump, the impeller may be changed to reduce the pump head to save pumping costs. In some cases, the pump oversizing is so high that the pump is changed for a smaller one.

With a variable speed pump the main balancing valve is not necessary. The maximum speed is adjusted to obtain the design flow in the Partner Valve of one of the risers. All the other flows will be automatically at design value.

Notes:
1. During the measurements in one module, external disturbances (isolation of another riser) have to be avoided. They may create some errors in the mathematical model elaborated by the CBI and some deviations in the flows obtained with the settings calculated.
2. When measuring the differential pressure across a balancing valve fully shut, remember that the mechanical protection of the CBI will intervene automatically when this differential pressure is higher than 200 kPa. Above this value a measurement cannot be done.
3. TA Balance Method is generally the quickest balancing method, as it requires only one setter using a very simple procedure. However, in comparison with the Compensated Method the setter has to go once more at each balancing valve (to make the measurements). Consequently, if the balancing valves are very difficult to reach, the Compensated Method can be sometimes more economical.

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BPV

Proportional Relief Valve

General

BPV is a proportional relief valve for use in heating and cooling installations. In installations with radiator valves, in which many of the radiator valves have closed, a big part of the pump head will affect the valves since the pressure drop in pipes and accessories has decreased. If the available differential pressure is higher than 30 kPa, noise may occur.

Technical Description

Application

Heating, cooling and domestic hot water systems.

Function

Proportional relief, adjustable differential pressure and shut-off.

Pressure class

PN 20

Temperature

Max working temperature: 120ºC
Min working temperature: -20ºC

Materials

Valve body, bonnet and stem:	AMETAL®
Union nuts, sleeve and cap:	Brass
Gaskets:	Graphite
Springs:	Stainless steel
O-rings:	EPDM rubber
Guide ring:	PTFE

AMETAL® is the dezincification resistant alloy of TA Hydronics.

Marking

Valve type, DN and inch size.

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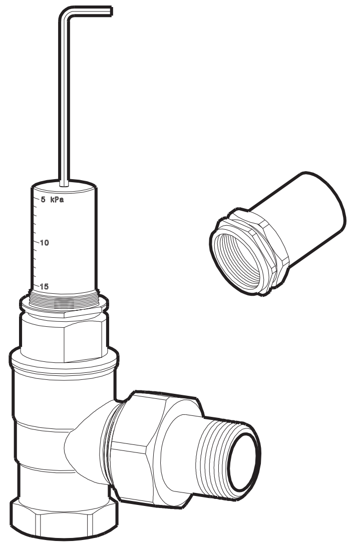
BPV

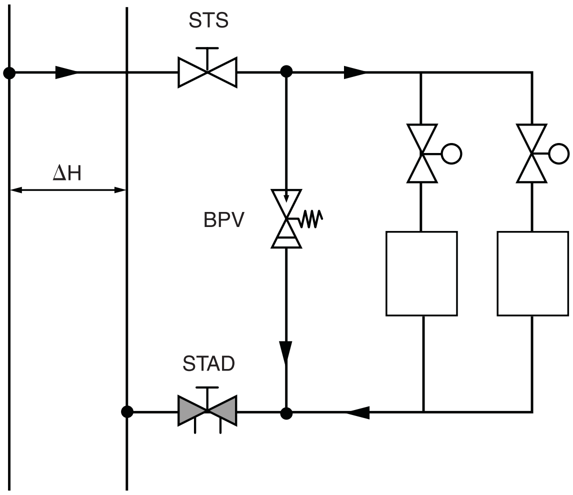
Proportional Relief Valve



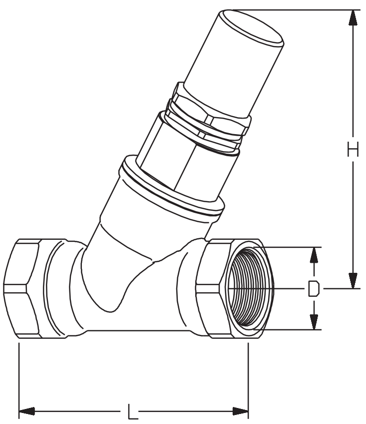
Installation of BPV

Install the BPV in the circuit after the balancing valve and between the supply and return pipe. The BPV is adjustable and opens at the preset differential pressure, making it possible to maintain desired pressure and flow in the distribution system.

Use an Allen key to adjust the BPV valve to operate at the required differential pressure.



Straight



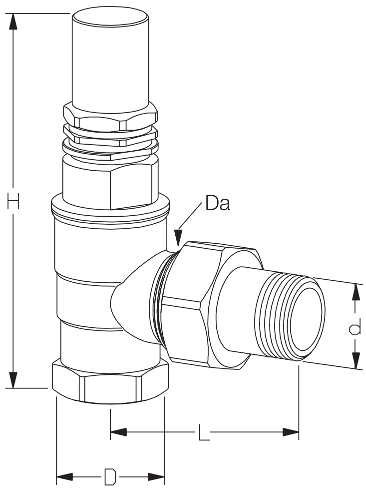
Straight Adjustable range 10-60 kPa

TA No	DN	D	L	H
52 198-315	15	G1/2	70	93
52 198-320	20	G3/4	85	93
52 198-325	25	G1	98	103
52 198-332	32	G1 1/4	112	105

Angle Adjustable range 10-60 kPa

TA No	DN	d	D	Da	L	H
52 198-020	20	R3/4	G3/4	M34x1,5	70	122
52 198-025	25	R1	G1	M40x2,0	83	138

Angle



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BPV

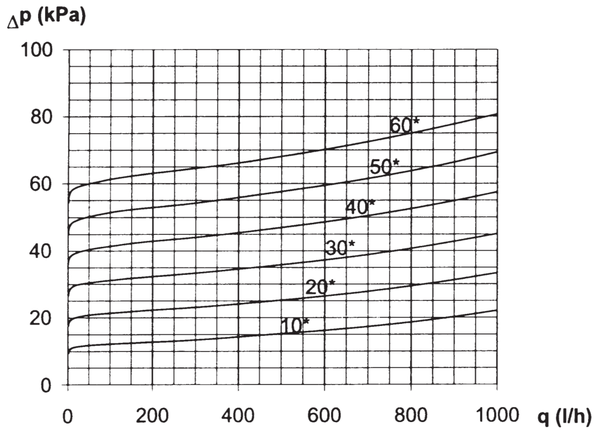
Proportional Relief Valve

Diagram BPV

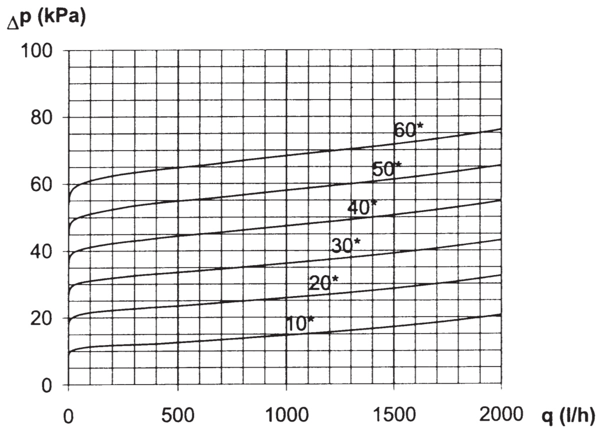
Valve characteristics

Adjust the BPV valve to the required differential pressure (10-60 kPa).
The valve characteristics will be as shown in the diagrams below.

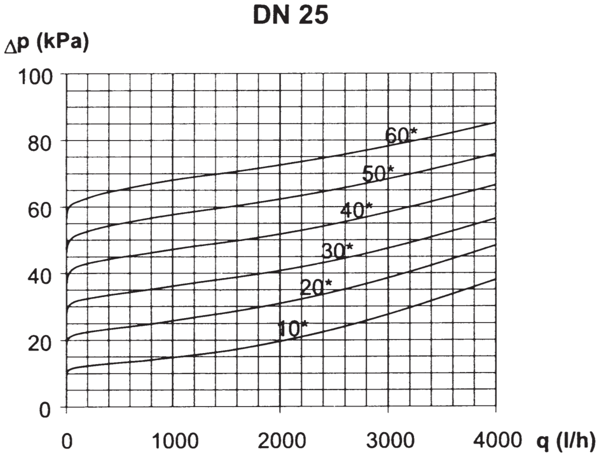
DN 15



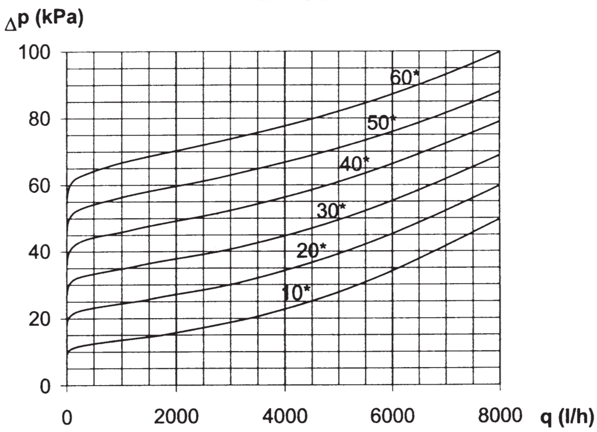
DN 20



DN 25



DN 32



*) Differential pressure setting.

Support material

Handbooks
See the following manuals for descriptions of various balancing methods:
Total hydronic balancing
Manual no. 1: Balancing control circuits
Manual no. 2: Balancing distribution systems
Manual no. 3: Balancing radiator systems
Manual no. 4: Stabilising differential pressure

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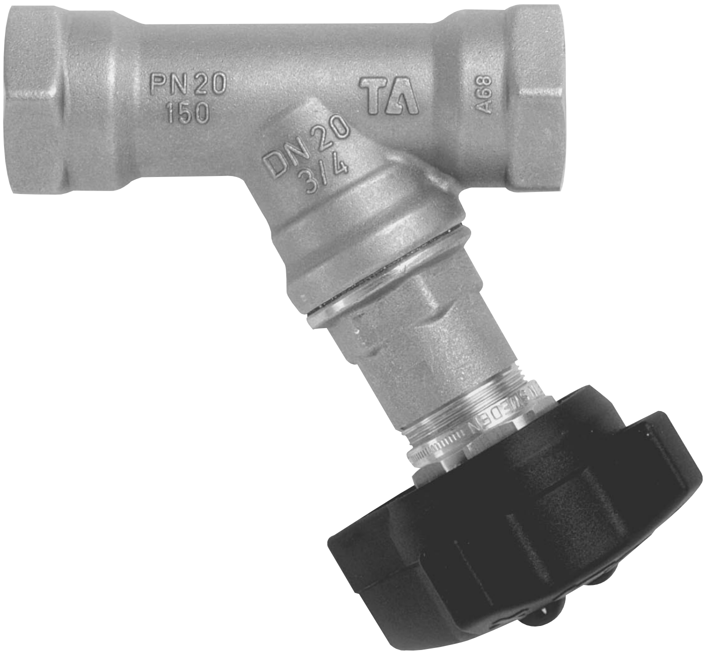
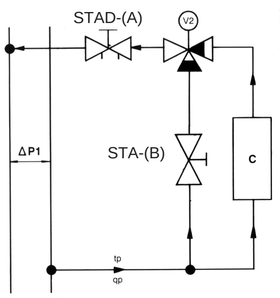
By-Pass Valve
STA-Balancing Valve



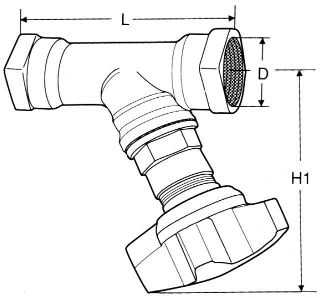
When a three way control valve is installed in the return line of a control loop it is used for mixing ie. two inputs one output. A Balancing Valve STAD-(A) is essential to adjust the constant flow to the correct value. A Balancing Valve STA-(B) is required in the by-pass to create the same pressure drop in the by-pass for design flow, as in the coil.

Application



Water flows		Control valve Authority ß>0.4	ΔpSTAD-(A) for qp	ΔpSTA-(B)	qpd/qsd
Primary	Secondary				
Constant	Variable	$\frac{\Delta p\ V2}{\Delta p\ V2+\Delta PC}$	ΔP1-ΔPV2-ΔPC	ΔPC	1

Technical Data



TA No.	DN	L	H1	D**
52 150 014	15	90	100	G1/2
52 150 020	20	97	100	G3/4
52 150 025	25	110	105	G1
52 150 032	32	124	110	G1 1/4
52 150 040	40	130	120	G1 1/2
52 150 050	50	155	120	G2

Max. working pressure 2000 kPa, PN 20, 2.0 Mpa
Max. working temperature – 120˚c (250˚F) continuous

Features

- Flow characteristics as STAD Balancing Valve.
- Tamper proof 'lockable'. Can be locked in 'set' position when adjusted to 'set' position.
- Manufactured from dezincification resistant copper alloy material, Ametal.®
- Cost effective.

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Snap-On Insulation

The simple and easy way to insulate your TA Balancing Valves on heating and cooling systems

Leaving a valve without insulation leads to unnecessary heat loss in heating and condensation in cooling systems. For this reason it is easy to understand why proper insulation quickly pays dividends. Now Prefabricated Insulation is available. Simply snap on the insulation pieces using two lock rings and in no time at all your balancing valve is perfectly insulated.

Performance Data

Fig. No.	Size mm	L	H1	H	øD
52 189 615	10	140	90	135	90
52 189 615	15	140	90	135	90
52 189 625	20	140	90	135	90
52 189 625	25	160	95	142	94
52 189 632	32	180	103	156	106
52 189 640	40	185	116	170	108
52 189 650	50	210	124	186	124
52 189 865	65	450	–	–	265
52 189 880	80	480	–	–	280
52 189 890	100	520	–	–	300
52 189 891	125	570	–	–	330
52 189 892	150	660	–	–	365

65mm and above, insulation to suit STA-F flanged balancing valves.

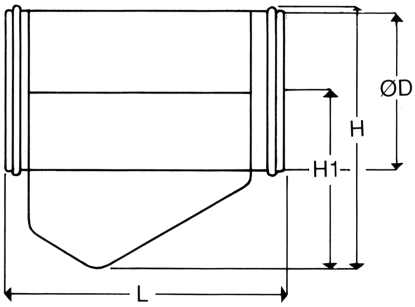
Tested AS1530.3.1989
Simultaneous determination of ignitability, flame propagation, heat and smoke release.

- Ignitability index 15 (Range 0-20)
- Spread of flame index 0 (Range 0-10)
- Heat evolved index 2 " "
- Smoked developed index 6 " "

Tests carried out 11-2-91 by AWTA Textile Testing

Technical Data

Material	Rigid Polyurethane Foam
Volume Weight	50-60 Kg/m^3
Operating Temp.	-35˚C to 120˚C (-22˚F to 250˚F)
Water Absorption	<2% at 20˚C
Covering	0.5mm PVC
Gaskets	**10mm to 50mm** Silicon Grease Molycote 44 **65mm to 150mm** Armaflex Glued around the valve bonnet and insulation halves



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