dynamx™ flow-control control valves DXN6_B_6

DXN6C15B.121601

- For 4-pipe applications with change-over
- Pressure-independent variable flow control
- Integrated flow measurement
- Supply voltage U_v : AC 24Volt
- Flow setpoint via control signal Y_1 : 0..10Vdc, split-range
- With 3 integrated digital inputs
- MODBUS RTU and BACnet MSTP communication (RS485)
- Wireless commissioning via Bluetooth® communication and/or Bluetooth® mesh
- Optional with integrated room temperature control (IRC)

heating / cooling

DN15 / DN25

Dynamic Flow Networking®

The *dynamx*™ control valves are designed for automatic and hydraulic balancing while providing real-time flow control, eliminating the need for static balancing valves. The *dynamx*™ control valves *provide* perfect hydraulic balance in the hydraulic network, both at full and part load, without additional components: Dynamic Flow Networking® (DFN).

DFN ™

Advantages

- 5-in-1 solution for variable flow rate
- automatic balancing
- unique V_{max} heating/cooling
- flow measurement and flow control
- maximum closing pressure 200kPa
- MP *MultiProtocol* communications
- Bluetooth® wireless commissioning

Description

The *dynamx*™ 6-port control valve, type DXN6_, combines five functions in one: (1) a changeover valve, (2) a control valve, (3) a pressure-independent balancing valve, (4) a shut-off valve and (5) optionally an integrated room temperature control.

DXN6_ is used in variable-flow HVAC systems and is designed, for example, for air-conditioned ceilings or fan coil units controlled by switching between heating and cooling (4-pipe systems). DXN6_ replaces both the (static) balancing valve, and the readjustment valve.

The DXN6_ made of brass is equipped with a flat coupling ISO228/1 and can be used in HVAC systems for buildings with water temperatures between +5°C..+90°C (non-condensing) with a nominal system pressure of 16 bar (PN16).

INNOVATION THE ORIGINAL BY BELPARTS

Patented technology

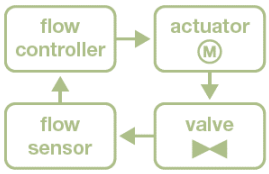
EP2307938
EP2706425
EP3812870
EP3280937
EP3918236 (pending)

Content

1. How it works

Dynamx™ flow-control control valves are designed to accurately control flow in any consumer. To do this, *dynamx*™ has 4 basic building blocks, namely a:

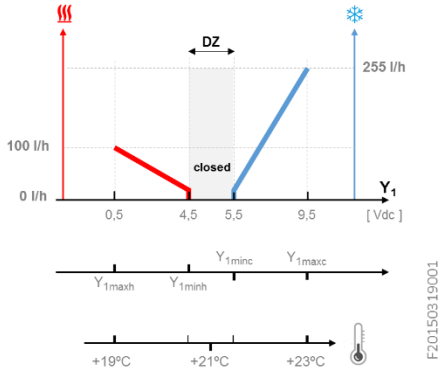
- control valve
- drive
- flow sensor
- flow regulator



Additional functions can be added on top of these basic building blocks, such as bus communication, wireless communication or additional inputs.

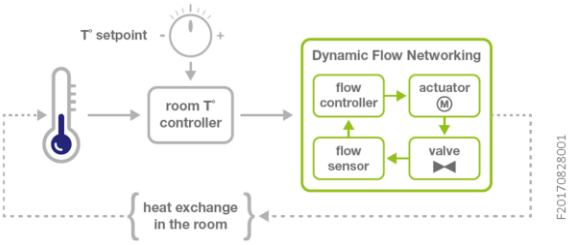
flow controller

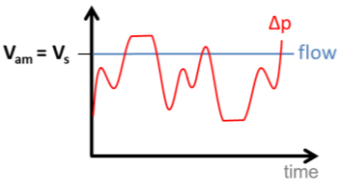
In *analog* mode, the internal flow controller of the *dynamx*™ valve receives a set point from the room T° controller via a split-range Y_1 : 0..10Vdc control signal (heating: 0.5..4.5Vdc and cooling: 5.5..9.5Vdc). Internally, this set point is converted into a flow set point, either heating or cooling. Example:



flow sensor

The integrated flow sensor continuously measures the actual flow rate. The internal control loop compares the actual flow rate with the required flow rate and adjusts the position of the control valve until the measured flow rate equals the required flow rate set point.





actuator

valve

Thus, the DXN6_ will control the flow rate in the direction of the desired setpoint, independent of possible pressure fluctuations in the system, e.g. in case of partial load. The control valve automatically adapts to the system parameters and searches for the ideal set point to ensure maximum user comfort with minimum energy consumption.

The output signal X_1 : 0..10Vdc representing the measured flow can be used to monitor the actual flow rate.

Thanks to this innovative technology, *dynamx*™ control valves can be used in a much larger flow range than conventional control valves.

Bluetooth®

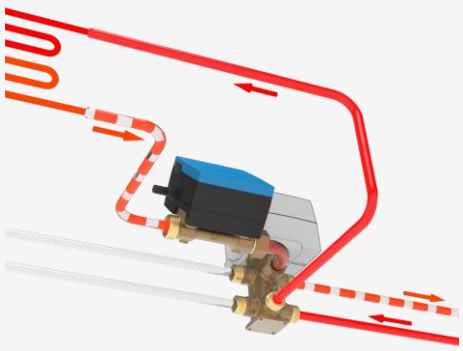
DXN6_ has wireless Bluetooth® communication on board, which allows easy wireless commissioning via a smartphone or tablet, even with the ceiling closed.

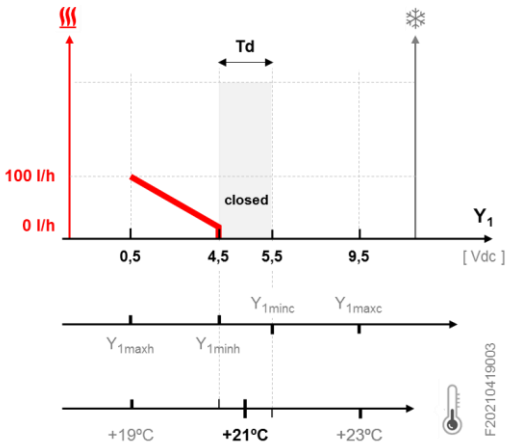
MP_ multiprotocol

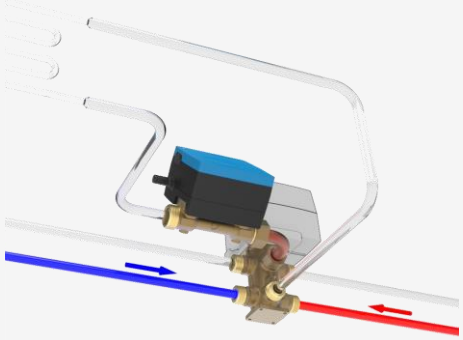
The *dynamx*™ control valves DXN6_ are equipped with MP *MultiProtocol* communication allowing them to be integrated into both MODBUS and BACnet networks.

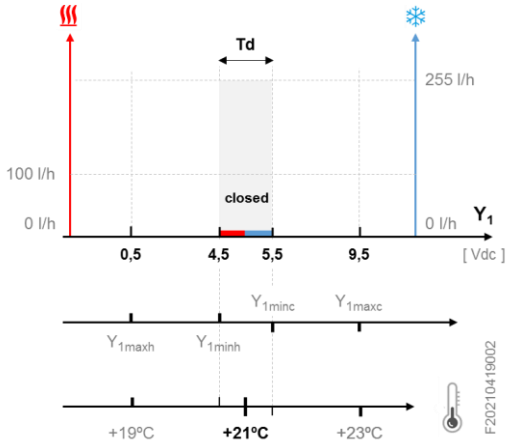
1. How it works

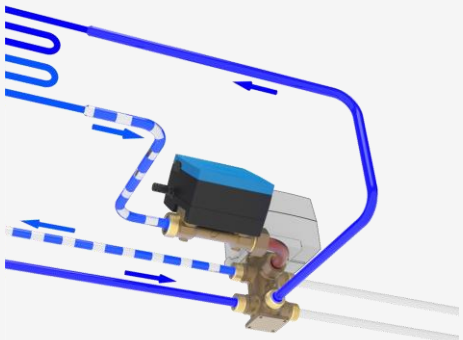
The *dynamx*™ DXN6_ control valves operate as a switch between heating and cooling, where the set design flow rate can be infinitely controlled between 0..Vmaxh (heating) or 0..Vmaxc (cooling).

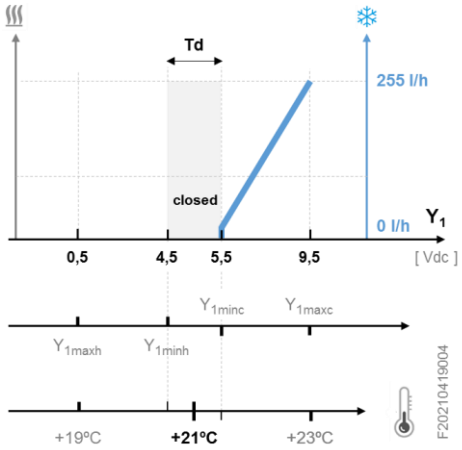












2. Technical specs

Electric

Supply voltage	**U_v**	AC 24 Volts (±20%), 50Hz (±5%)
Consumption	*when controlling*	3.5W (4.5VA)
	standby	1,5W
Input signal	**Y_1**	0..10Vdc (0.17mA), split range
	0.5..4.5Vdc	heating: maximum flow rate heating➔ 0%
	5.5..9.5Vdc	cooling: 0%➔ maximum flow rate cooling
Feedback signal	**X_1**	0..10Vdc (≤ 2mA) actual flow rate, scaled according to the max flow rate heating or cooling
Connection [1]	*main cable*	1m PVC cable, 7x 0.5mm² or 4x 0.5mm²
	DI inputs	1m PVC cable, 4x 0.14mm²

Flow measurement

Sensor type	ultrasonic sensor TTM, no moving parts
Unit of measurement	m³/h[2] , l/s, l/min, gpm (UK), gpm (US)

Hydraulic

Nominal pressure		PN16 (16 bar)
Control characteristic		equiprocentual[2] or linear
Change-over		mode heating or cooling via Y_1 or BUS
Leakage rate		According to EN12266-1: A (air-tight)
Differential pressure	**Δp** *min.*	no minimum differential pressure required
	Δp_s *max.*	2bar (200kPa)
Rated flow rate	**V_{nom}**	1,400 l/h (DN15) - 2,500 l/h (DN25)
Flow rate setpoint	**V_{max}**	separate setting design flow V_{max}
		heating and V_{max} cooling: 5..100% of V_{nom}
Flow rate set point control		- via an analog control signal (Y_1), or - via bus communication, or - via Bluetooth® communication and APP
Medium		water (glycol-free)
Medium quality		according to VDI 2035
Medium temperature		+5°C..+90°C
Startup time		3..5min after startup

Fixture	**DXN6C15B_**	**DXN6P15B_** [4]	**DXN6P25B_**
Heart distance	40mm	45mm	60mm
DN size	DN15		DN25
K_{vs} value	1.4m/h³		2.5m/h³
Flat couplings ISO228/1	5x G½" + 1x G¾" [5]		6x G1"

Drive

Torque	min. 8Nm at rated voltage
Noise level during control	< 30db(A)
Manual	drive is unlocked via external switch

1) the number of cores depends on the version number
2) factory default
3) optional
4) this series will be discontinued and replaced by DXN6C15B_
5) reduction 1x G½" + 1x G¾" available as accessories Item No. 011404 (to be ordered separately)

2. Technical characteristics

Material

Housing		ABS, PC
Parts in contact with water		CW617N brass, EPDM, PPSU, composites stainless steel (1.4401, 1.4301)

Surroundings

Humidity		maximum 90% HR, non-condensing
Maintenance / calibration		no maintenance nor calibration required
IP degree of protection		IP54 (drive IP43)
Temperature	*area*	+10°C .. +45°C
	storage	-20°C .. +50°C
Height		< 2000m

3. MP *MultiProtocol*

The *dynamx*™ DXN6_ control valves can optionally be supplied with an RS485 bus communication interface with the MP *MultiProtocol* functionality for easy integration[1)] into any building management system (BMS).

Thanks to this MP *MultiProtocol* communication, the DXN6_ valves can be integrated into different types of networks:

- MODBUS
- BACnet
- Bluetooth®

By integrating the *dynamx*™ control valves into a MODBUS or BACnet network, the set point can also be controlled by the bus, the actual flow rate can be monitored remotely, etc. The bus also provides the ability to customize a selection of settings.

System Integration

Protocol	**MODBUS**	RTU/MSTP, slave
	BACnet	MSTP, slave
	Bluetooth®	with license-free APP, dxLink 21™
Physical layer wired network		RS485, not isolated
Type of bus cable		2-wire twisted pair with common shielded twisted pair STP or FTP
Unit load		1/8
Terminal resistance		120Ω end resistor (R_{TERM}) to each end of the bus
Communication settings [2)]		• 9600, 19200 or **38400**[3)] Baud • 1 starter bit • **even**[3)] / odd / no parity • 8 data bits • 1 stop bit
Topology		multi-drop bus, maximum length 1,000m
Stub length		maximum 1m, preferably in daisy chain

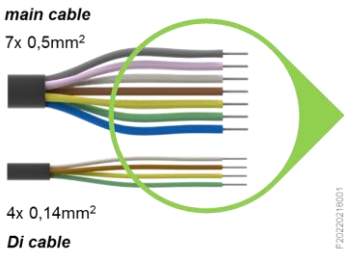
[1)] the installer is responsible for compliance with local EMC regulations when installing, connecting and commissioning the DXN6_ in a communications bus network

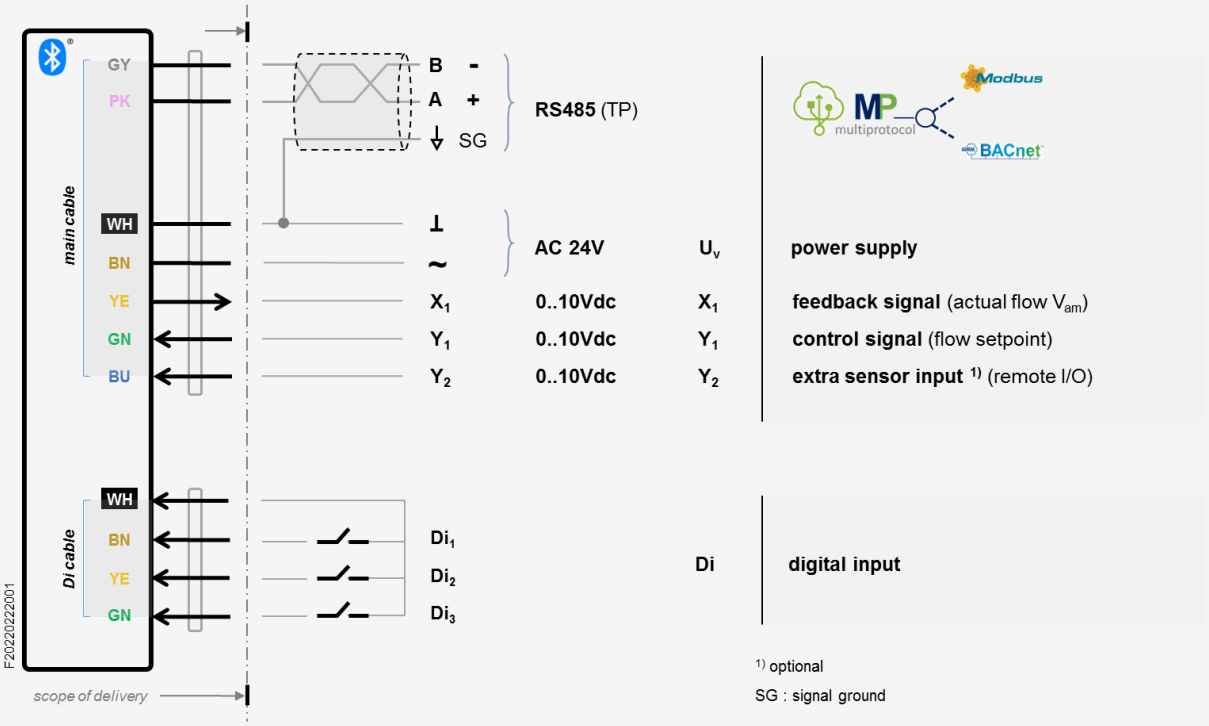
[2)] can be set via the Bluetooth® dxLink21™ APP or via the dxLink™ MS Windows commissioning tool via MODBUS communication

[3)] default settings

4. Electrical connection

DXN6_B.121601	Standaard
DXN6_B00.122601	Bluetooth® mesh





WH	BN	GN	YE	BU	PK	GY
white	brown	green	yellow	blue	pink	grey
wit	bruin	groen	geel	blauw	roos	grijs
blanc	brun	vert	jaune	bleu	rose	gris
weiß	braun	grün	gelb	blau	pink	grau

Individual wires are color coded, no numbering. Color coding according DIN 47100.

A low voltage transformer must be used in accordance with local regulations.

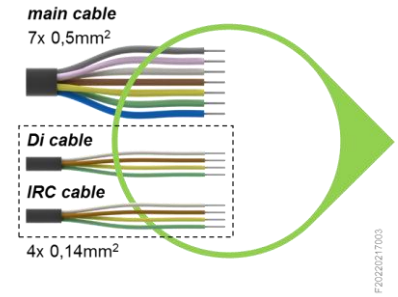
With alternating current, always observe the correct polarity!

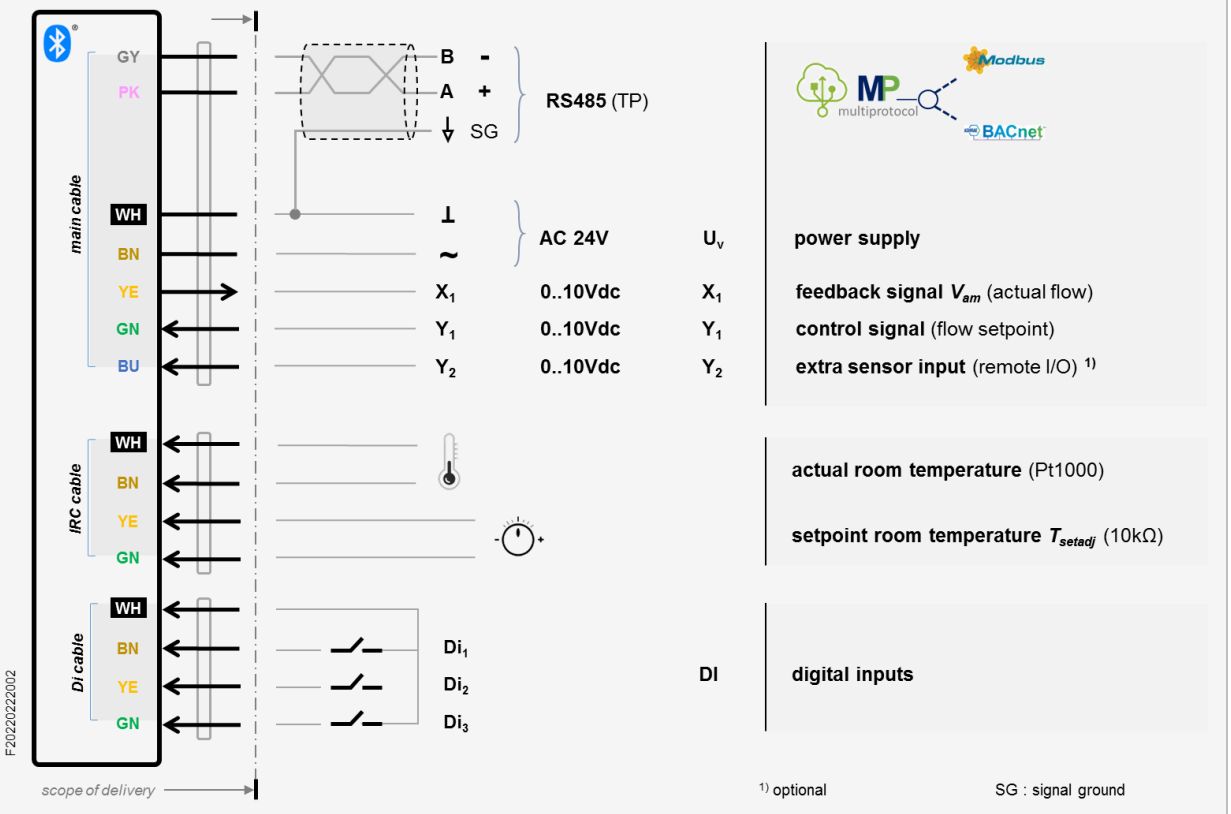
In accordance with the Electromagnetic Compatibility Directive 2014/32/EU, according to the applied standards

- EN 61000-3-2 (2014)
- EN 61000-3-3 (2013)
- EN 61000-6-1 (2007)
- EN 61000-6-3 (2007) (A1: 2011 / AC: 2012)

4. Electrical connection

DXN6_B00. 121601 Integrated Room Control (IRC)





WH	BN	GN	YE	BU	PK	GY
white	brown	green	yellow	blue	pink	grey
wit	bruin	groen	geel	blauw	roos	grijs
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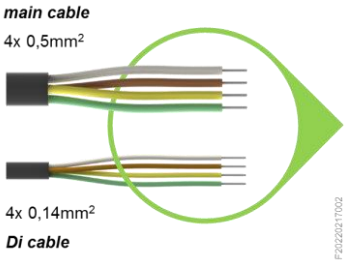
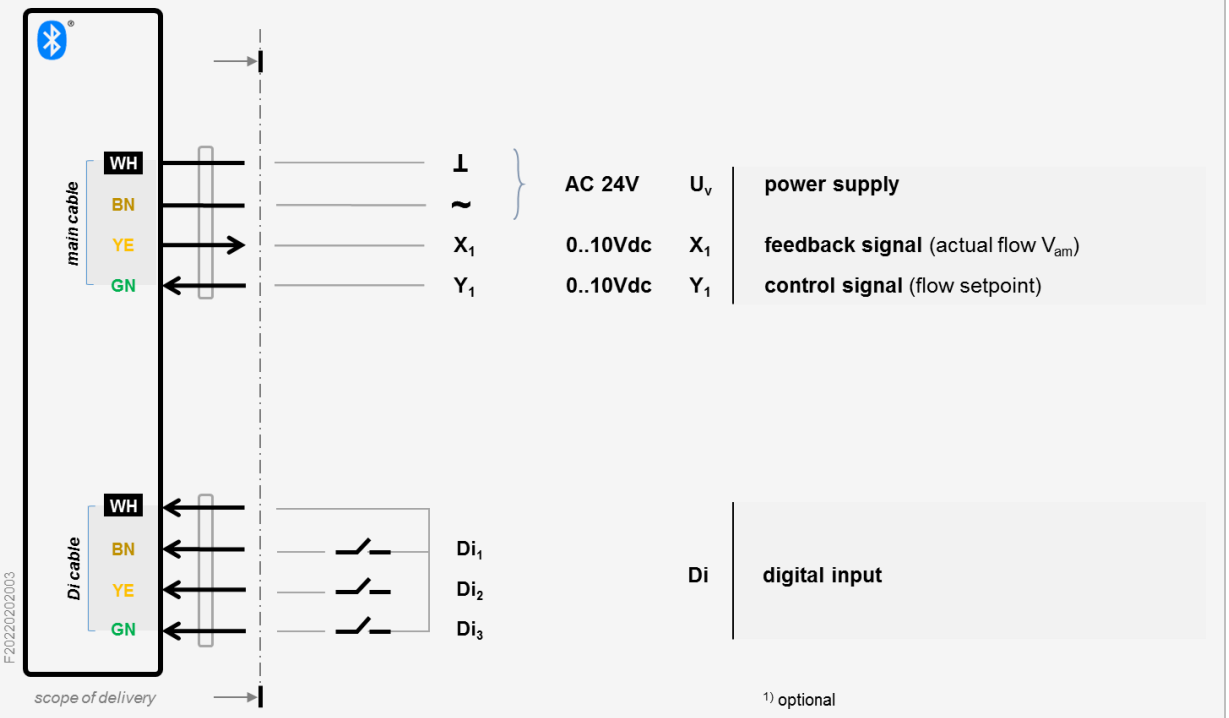
- EN 61000-6-1 (2007)
- EN 61000-6-3 (2007) (A1: 2011 / AC: 2012)

4. Electrical connection

DXN6_B. 121001 Standalone





WH	BN	GN	YE	BU	PK	GY
white	brown	green	yellow	blue	pink	grey
wit	bruin	groen	geel	blauw	roos	grijs
blanc	brun	vert	jaune	bleu	rose	gris
weiß	braun	grün	gelb	blau	pink	grau

Individual wires are color coded, no numbering. Color coding according DIN 47100.

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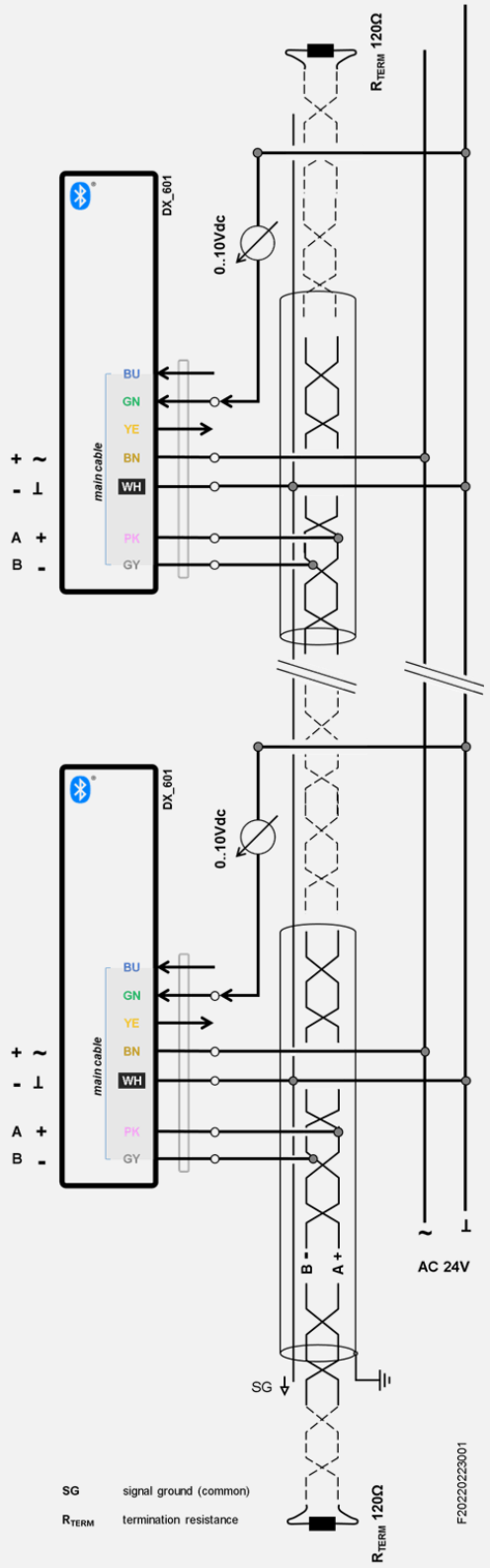
- EN 61000-3-3 (2013)
- EN 61000-6-1 (2007)
- EN 61000-6-3 (2007) (A1: 2011 / AC: 2012)

4. Electrical connection

Application example 4 I 4

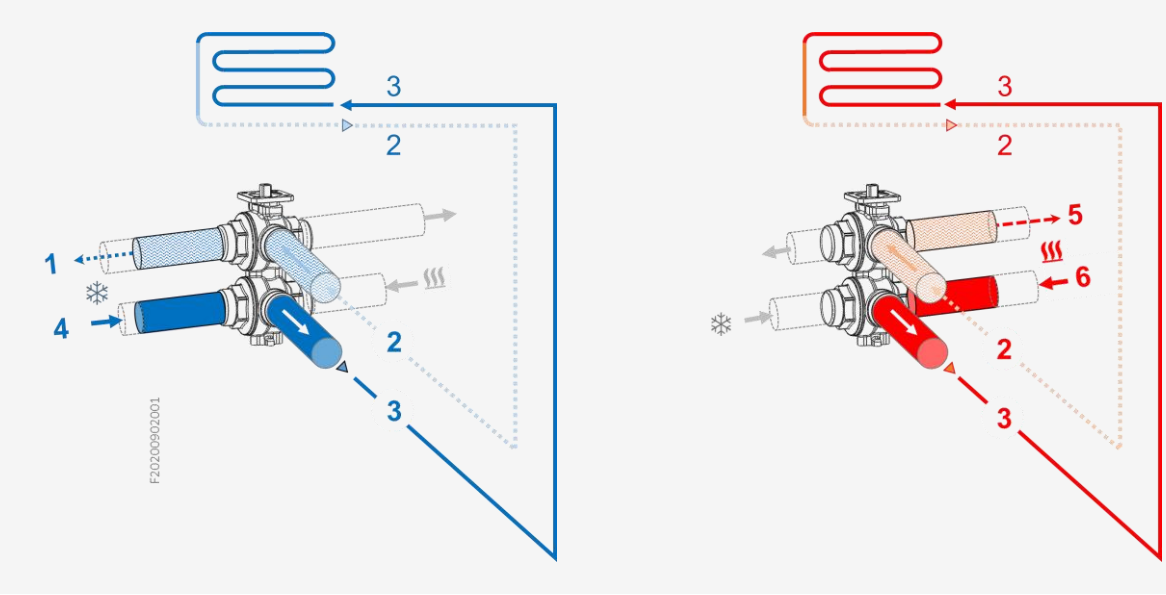
DXN6_B_601



5. Hydraulic mounting

The *dynamx*™ DXN6_ valves have a fixed flow direction and fixed connection for heating and cooling as shown in the drawing below.

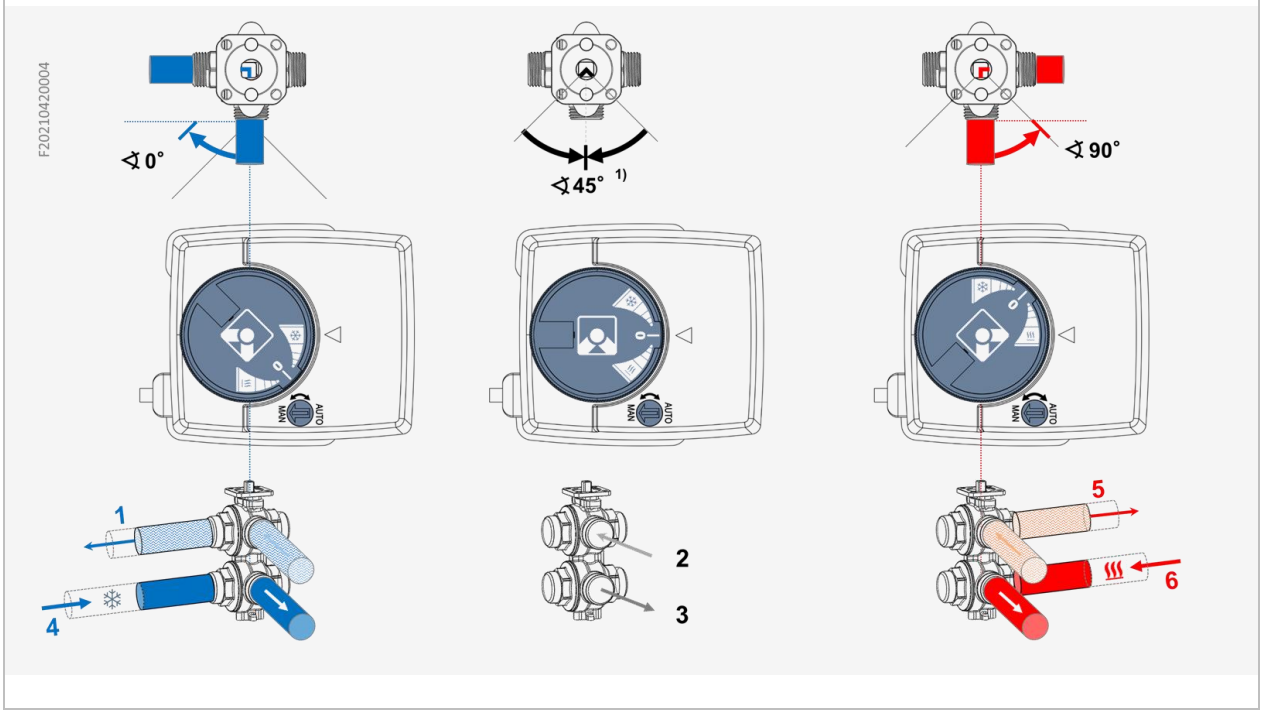
connection cooling / heating and supply / return (DXN6C15B_)



Change-over

The *dynamx*™ DXN6_ control valves feature an integrated 6-port ball valve with a 90° rotation angle to switch between heating and cooling.

factory default setting 45°◁ = no flow rate



6. Flow range

To enable optimal sizing and reduce pumping energy to the absolute minimum, *dynamx*™ 6-port control valves, DXN6 series, are available in two different flow ranges.

Type	DN	K_{vs}	V_5	V_{10}	V_{20}	V_{max}	V_{nom}
	[mm]	[m³/h]	[l/h]	[l/h]	[l/h]	[l/h]	[l/h]
DXN6C15B_	15	1,4	310	440	625	70..1.400	1.400
DXN6P15B_ [1)]	15	1,4	310	440	625	70..1.400	1.400
DXN6P25B_	25	2,5	555	790	1.115	70..2.500	2.500

1 bar ≈ 100 kPa

1 m/h³ = 1000 l/h = 16.7 l/min = 0.28 l/s

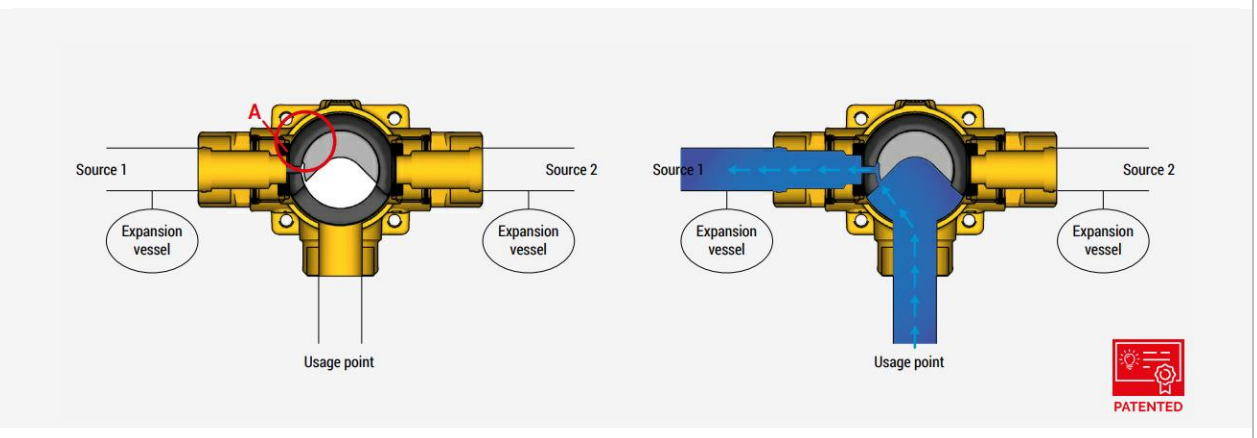
Legend		flow rate range at Δp	
K_{vs}	K_{vs} value of the DXN6_	V_5	5kPa
V_{max}	design flow	V_{10}	10kPa
V_{nom}	maximum flow rate of the DXN6_.	V_{20}	20kPa

[1)] discontinued, replaced by DXN6C15B_

7. Overpressure protection

DXN6_ control valves have integrated overpressure protection to compensate for pressure fluctuations in closed position (◁ 45°). The water to the end user (usage point) is isolated when the control valve is in a closed position. The pressure of the water in (e.g.) the climate ceiling can thus increase or decrease when the water temperature changes.

pressure relief valve DXN6C15B_



A small opening in the top port of the 6-port control valve, keeps the climate ceiling (point of use) connected to "source 1" (source 1) even when the control valve is closed. However, this opening prevents water from flowing when the valve is closed, and does not compromise the leak-tight seal of the DXN6_ control valve. No water can flow through the end user when the control valve is closed. Thus, the two hydraulic sources heating and cooling, are always separated.

8. Status LED

The integrated LEDs provide useful information that can help with startup and commissioning.

Status	
power supply	
Bluetooth® communication	
bus network	

7

9. Bluetooth® commissioning dxLink21™

Available on the App Store Google Play

Thanks to the integrated Bluetooth® technology, the DXN6_ valves provide a wireless interface for commissioning purposes.

There is no easier way to install and properly commission your hydraulic systems than with the dxLink™21 APP.

This function can be used simultaneously with MODBUS or BACnet bus communication.

Note: these features may not be available on all versions, check ordering information

10. Software tool dxLink™

All *dynamx*™ control valves can be easily integrated into any building management system but can also be used as standalone control valves.

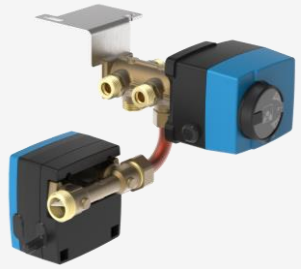
dxLink™ is a software tool that allows *dynamx*™ control valves to be commissioned remotely, using the MODBUS bus communication capabilities of the control valves. This means that commissioning of a dynamx™ control valve does not require on-site intervention but can be performed from a central location. This significantly reduces the time required to commission the HVAC system and makes the system less prone to errors.

The dxLink™ software works with the Windows operating system.

11. Accessories

Item		Description	
012692		DX.10M.012692	Universal mounting bracket for DXN6_ (DN15 and DN25)

Installation size 60mm with universal mounting bracket DX.10M.012692



DXN6C15B_

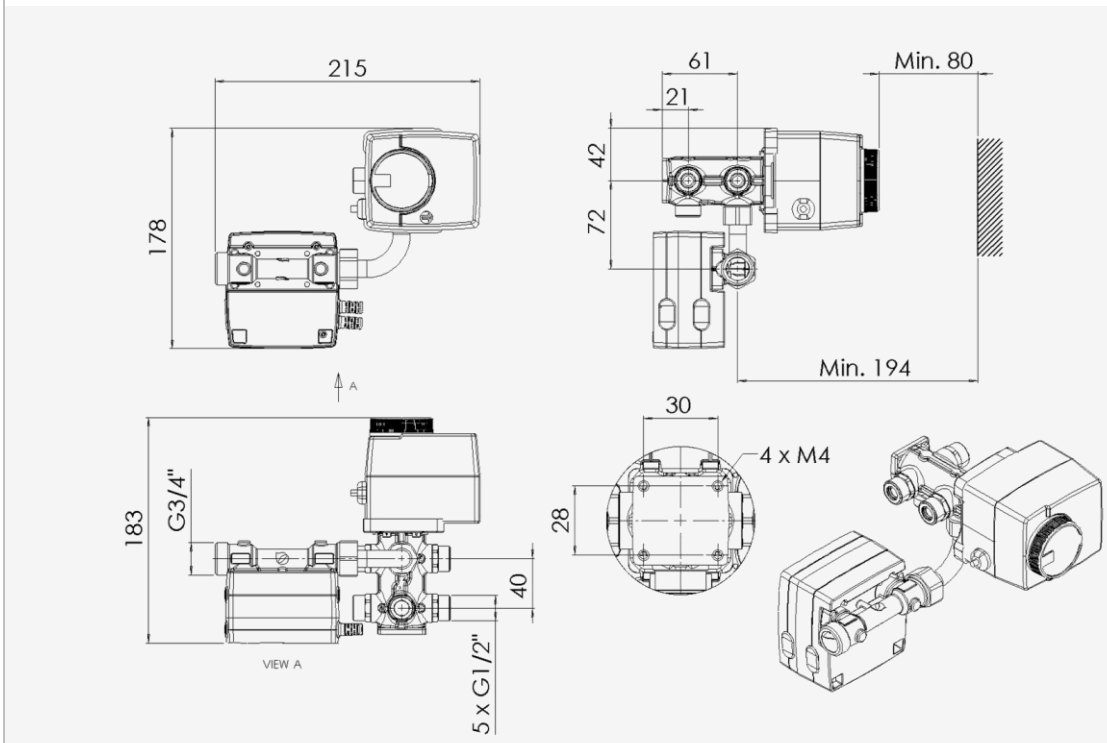
DXN6P25B_

Item		Description	
011457		T.BKH.F12M12.RD	Tailpiece with integrated ball valve, red lever male G½" x female G½" (cable gland)
011458		T.BKH.F12M12.BL	Tailpiece with integrated ball valve, blue lever male G½" x female G½" (cable gland)
010789		T.BK.G34.T34	Tailpiece with integrated ball valve female G¾" x female G¾" (swivel)
010788		T.BK.G1.T34	Tailpiece with integrated ball valve female G¾" x female G1" (swivel)
011229		T.N6.SBU12	Tailpiece male G½" x female G1" (swivel) for DXN6P25 (2pcs)
010818		T.N6.SBU34	Tailpiece male G¾" x female G1" (swivel) for DXN6P25 (2pcs)
011404		DX.10H.011404	Reduction male G½" x female G¾" for DXN6_ DN15

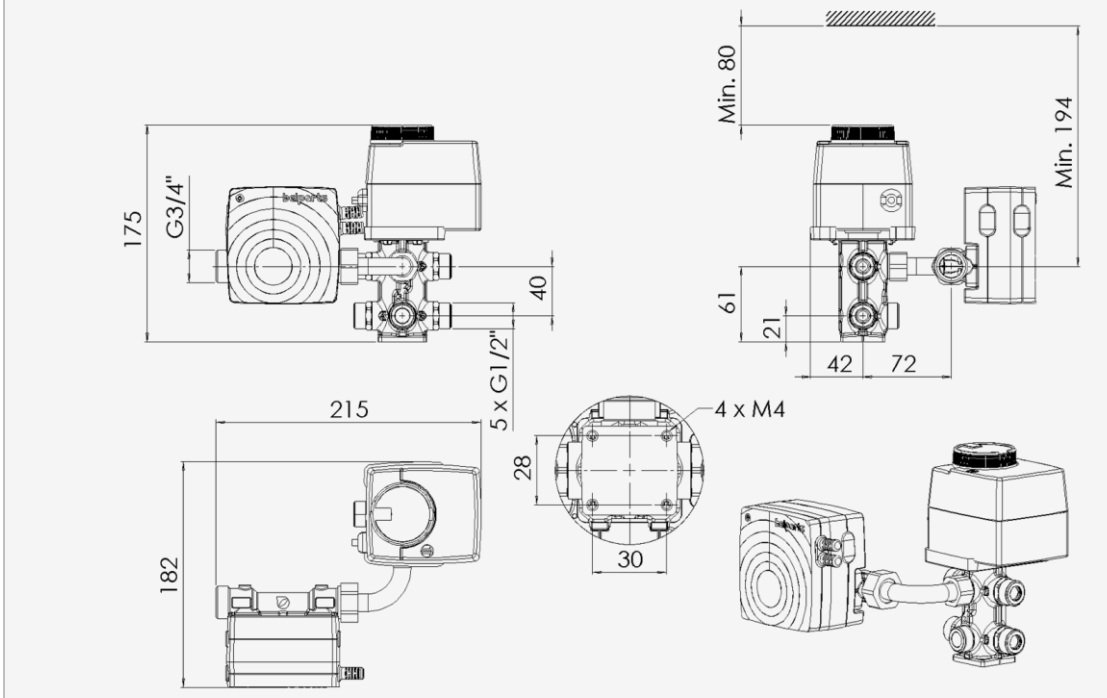
12. Dimensions

All dimensions in [mm]

DXN6C15B_ DN15 | center distance 40mm Ceiling and floor mounting



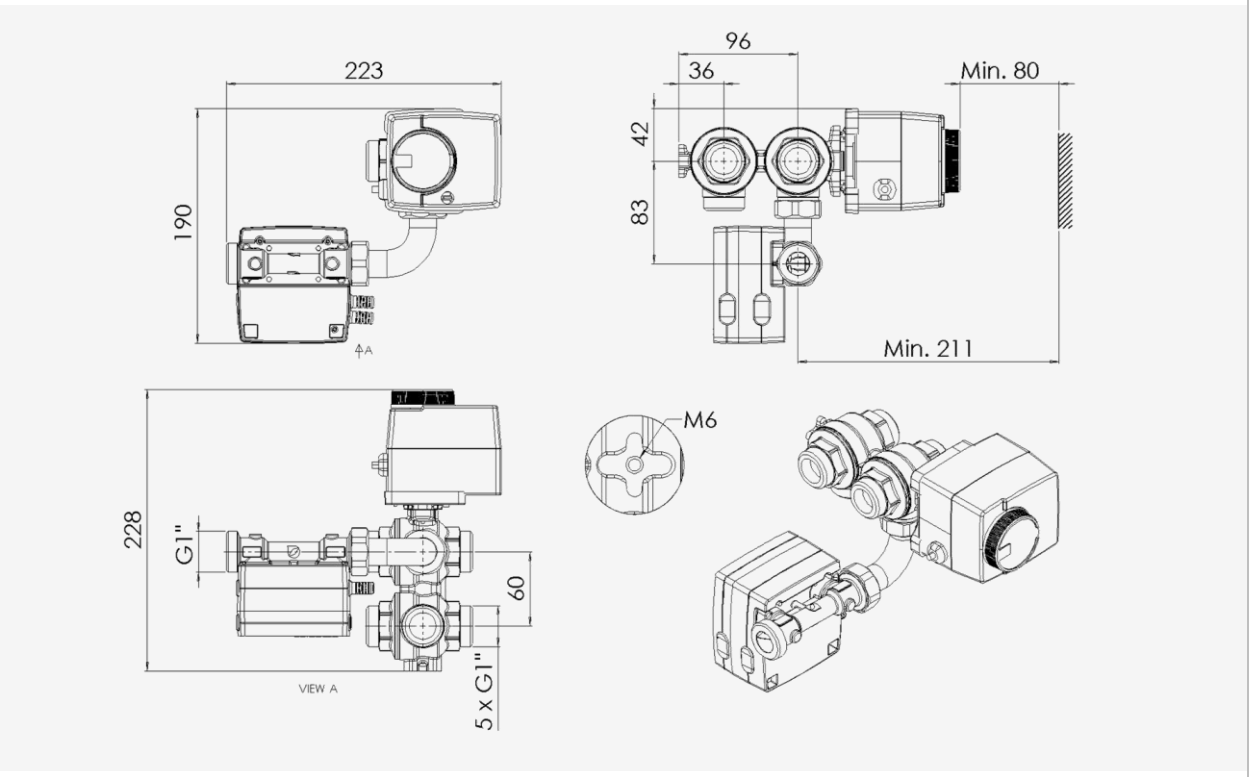
DXN6C15B_ DN15 | center distance 40mm Wall mount



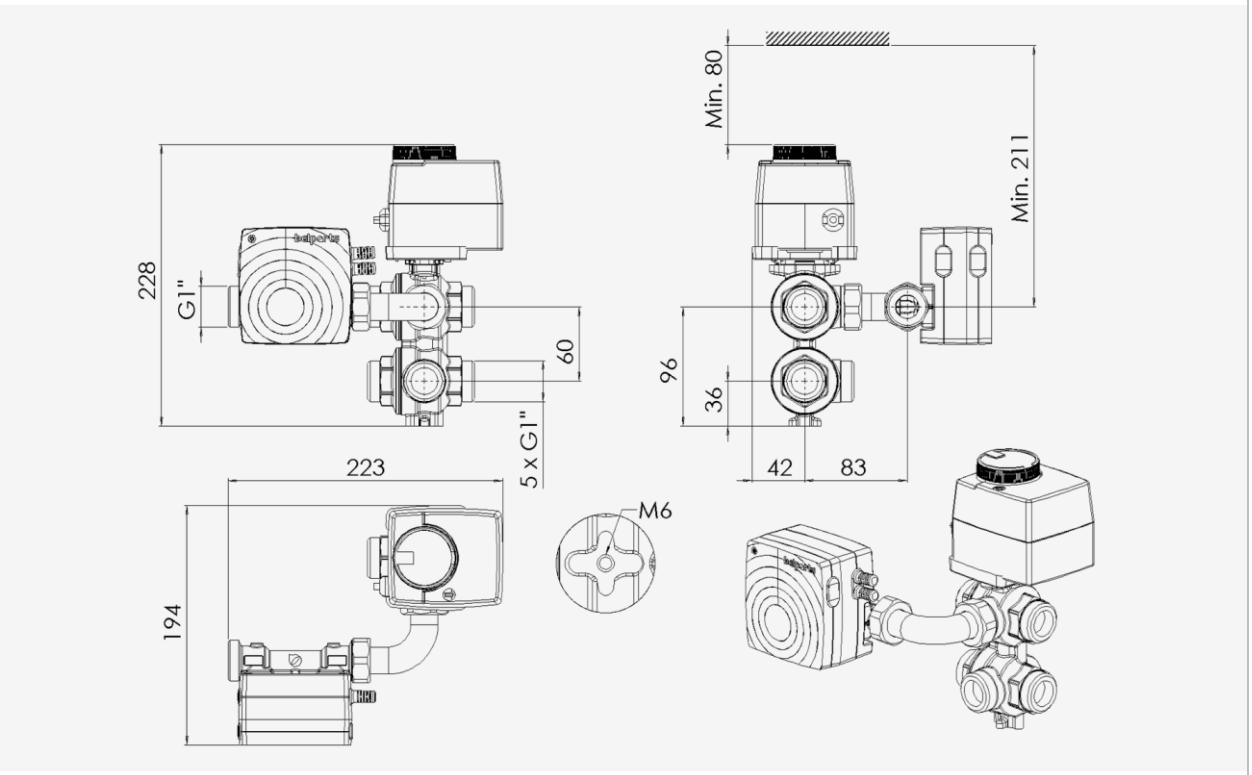
12. Dimensions

All dimensions in [mm]

DXN6P25B_ DN25 | center distance 60mm Ceiling and floor mounting



DXN6P25B_ DN25 | center distance 60mm Wall mount



13. Article coding

DXN	6	C	15	B	1	2	1	6	0	1	*Example*
	SERIES				VERSION						
											***dynamx*™ control valves**
DXN											**DXN** *dynamx*™ ONE
											Number of ports
	6										**6** 6-port control valve (change-over)
											Connection (flat couplings ISO228/1)
		C									**C** H15: 40mm (compact version)
		P									**P** H15: 45mm / H25: 60mm
											DN size
			15								**15** DN15, G½"
			25								**25** DN25, G1"
											Function
				B							**B** standard flow-control functionality
				B00							**B00** version B + Integrated Room Control (IRC)
											Supply voltage
					1						**1** AC 24 volts
											Configuration
						2					**2** standard design (90°)
											Wireless interface
							1				**1** integrated Bluetooth® communication ▲
							2				**2** wireless Bluetooth® mesh networking △
											Bus communication
								6			**6** with *MultiProtocol* on RS485 : MODBUS, BACnet and Bluetooth®
											ΔT measurement
									0		**0** without ΔT measurement
									2		**2** with ΔT measurement [1]
											Cable length
										1	**1** 1m PVC cable

[1] ΔT measurement cannot be combined with IRC function (B00)

▲ standard design (assembly-to-order, delivery times may vary)

△ special design, delivery time on request, min. quantities apply

14. Ordering Information

	Type	G_v	H	V_5	V_{10}	V_{20}	V_{max}	Δp_s	U_v	Y_1	Di	IRC			MODBUS	BACnet
		[inch]	[mm]	[l/h]	[l/h]	[l/h]	[l/h]	[kPa]	[Volts]	[Volts]	3x	1x				
									AC 24	0..10Vdc						
	DN15 			*design flow rate at Δp*												
				5kPa	10kPa	20kPa										
△	**DXN6C15B.121001**	G½"	40	310	440	625	1.400	200	●	●	●	-	●	-	-	-
▲	**DXN6C15B.121601**	G½"	40	310	440	625	1.400	200	●	●	●	-	●	-	●	●
▲	**DXN6C15B00.121601**	G½"	40	310	440	625	1.400	200	●	●	●	●	●	-	●	●
▲	**DXN6C15B00.122601**	G½"	40	310	440	625	1.400	200	●	●	●	●	-	●	●	●
	DN25 			*design flow rate at Δp*												
				5kPa	10kPa	20kPa										
△	**DXN6P25B.121001**	G1"	60	555	790	1.115	2.500	200	●	●	●	-	●	-	-	-
▲	**DXN6P25B.121601**	G1"	60	555	790	1.115	2.500	200	●	●	●	-	●	-	●	●
▲	**DXN6P25B00.121601**	G1"	60	555	790	1.115	2.500	200	●	●	●	●	●	-	●	●
▲	**DXN6P25B00.122601**	G1"	60	555	790	1.115	2.500	200	●	●	●	●	-	●	●	●

Legend

G_v	connection DXN6_ control valve	U_v	power supply		Bluetooth® wireless communication
H	center distance DXN6_ control valve	Di	digital inputs		one-to-one
V_{max}	design flow rate	IRC	Integrated Room Control		wireless network Bluetooth® mesh
Δp_s	maximum shut-off pressure	Y_1	control signal 0..10Vdc (split range)		RS485 TP network

▲ standard design (assembly to order, delivery times may vary)

△ special design, delivery times on request, min. quantities apply

15. DXN6P15B_ (discontinued)

Type	G_v	H	V_5	V_{10}	V_{20}	V_{max}	Δp_s	U_v	Y_1	Di	IRC				
	[inch]	[mm]	[l/h]	[l/h]	[l/h]	[l/h]	[kPa]	[Volts]	[Volts]	3x	1x				
								AC 24	0..10Vdc					MODBUS	BACnet
DN15			*design flow rate at Δp*												
			5kPa	10kPa	20kPa										
[1] **DXN6P15B.121601**	G½"	45	310	440	625	1.400	200	●	●	●	-	●	-	●	●

[1] Important note!

Not recommended for new projects! These versions are currently being phased out and will no longer be available starting in 2023.

*For DN15 versions, the **DXN6C15B**_ series is recommended, see page 17.*

Legend

G_v	connection DXN6_ control valve	U_v	power supply		Bluetooth® wireless communication
H	center distance DXN6_ control valve	Di	digital inputs		one-to-one
V_{max}	design flow rate	IRC	Integrated Room Control		wireless network Bluetooth® mesh
Δp_s	maximum shut-off pressure	Y_1	control signal 0..10Vdc (split range)		RS485 TP network

▲ standard design (assembly to order, delivery times may vary)

△ special design, delivery times on request, min. quantities apply

16. Related Information

1	Assembly Instructions		MI 20210406001A
2	MODBUS register-list		MI 20220105001A
3	BACnet PICS		MI 20220105002A
4	REVIT-data files (BIM)	🔗	www.belparts.com

17. Intellectual property

DXN6_ is based on technology protected by international patents:

- European Patent No. EP2307938
- European Patent No. EP2706425
- European Patent No. EP3812870
- European Patent No. EP3280937
- European Patent No. EP3918236 (patent pending)
- Chinese Patent no. ZL200880130728.9
- United States Patent No. 9823666
- United States Patent No. 10394257
- Registered community model RCD No. 004030633-0001
- Registered community model RCD No. 004030633-0002

Notes