

Industrial
Hydraulics

Electric Drives
and Controls

Linear Motion and
Assembly Technologies

Pneumatics

Service
Automation

Mobile
Hydraulics

Rexroth
Bosch Group

2- and 3-way high-response cartridge valve

RE 29136/12.04
Replaces: 05.03

1/24

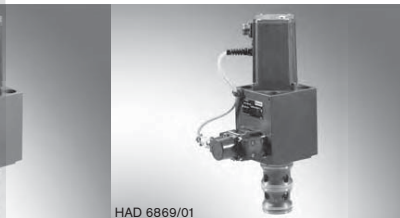
Type .WRCE.../S

Sizes 32, 40 and 50
Component series 2X
Maximum operating pressure 420 bar
Maximum flow 4500 L/min



HAD 6870/01

Type 2WRCE...-2X/S



HAD 6869/01

Type 3WRCE...-2X/S

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Features

- Pilot operated 3-stage high-response valve
- Suitable for closed-loop controlling of position, pressure, force and velocity
- Pilot control valve:
 - 2-stage servo-valve of size 6 or 10 with mechanical feedback, trimmed; closes the 2WRCE main stage and opens the 3WRCE main stage from A to T in the event of a power failure when pilot pressure is applied
- Main stage: closed-loop position controlled
- Integrated open and closed-loop control electronics (OBE)
- Block installation:
 - Mounting cavity to DIN ISO 7368 for 2WRCE
- Typical applications:
 - Presses
 - Die-casting machines
 - Punching axes
- Further information:
 - Pilot control valve
 - Servo-valve of size 6 RE 29564
 - Servo-valve of size 10 RE 29583

Note
Type .WRCE.../P with proportional pilot valve,
see RE 29137

Ordering code: Type 2WRCE

2	WRCE	S	-2X/S	K31/	*
2/2 directional valve = 2					
Electrically operated cartridge type high-response valve with integrated electronics (OBE) = WRCE					
Size 32	= 32				
Size 40	= 40				
Size 50	= 50				
Poppet = S					
Nominal flow in L/min at 5 bar valve pressure drop					
Size 32: 650 L/min linear, ...S650L... only	= 650				
480 L/min with fine control range, ...S480R... only	= 480				
Size 40: 1000 L/min linear, ...S1000L... only	= 1000				
700 L/min with fine control range, ...S700R... only	= 700				
Size 50: 1600 L/min linear, ...S1600L... only	= 1600				
1100 L/min with fine control range, ...S1100R... only	= 1100				
Characteristic curve shape					
Linear	= L				
Linear, with progressive fine control range	= R				
Component series 20 to 29	= 2X				
(20 to 29: unchanged installation and connection dimensions)					
Pilot control valve					
Servo-valve	= S				
Supply voltage 24VDC	= G24				
Supply voltage ± 15VDC	= G15				
Electrical connection					
Without cable socket, with component plug to DIN EN 175201-804	= K31				
(separate order, see page 12)					
Interfaces					
Command value 0 ...+10 V, actual value 0.5 ...+10 V	= A1				
Command value 0 ...+10 mA, actual value 0.5 ...+10 mA	= C1				
Sandwich plate shut-off valve					
Without shut-off valve	= No code				
With shut-off valve					
De-energised shut-off valve actively closes 2WRCE when pilot pressure is applied	= WK15				
De-energised shut-off valve actively opens 2WRCE when pilot pressure is applied	= WL15				
Voltage supply 24 VDC, cable socket separate order, see page 12					
Seals					
NBR seals, suitable for mineral oil HL and HLP to DIN 51524	= M				
FKM seals	= V				
Further details in clear text					

Preferred types:

Type 2WRCE	Material no.
2WRCE 32 S650L-2X/SG24K31/A1M	R900768408
2WRCE 40 S1000L-2X/SG24K31/A1M	R900768412
2WRCE 50 S1600L-2X/SG24K31/A1M	R900770094

Ordering code: 3WRCE

3	WRCE					-2X/	S		K31/			*
3/2 directional valve = 3												
Electrically operated cartridge type high-response valve with integrated electronics (OBE) = WRCE												
Size 32 = 32												
Size 40 = 40												
Size 50 = 50												
Sliding spool, zero overlap (+0.5...+1.5%) = V												
Sliding spool, with 10...13 % pos. overlap = E												
Nominal flow in L/min at 5 bar valve pressure drop												
Size 32: 290 L/min linear, ...V290L... only = 290												
250 L/min with fine control range, ...E250P... only = 250												
Size 40 460 L/min linear, ...V460L... only = 460												
410 L/min with fine control range, ...E410P... only = 410												
Size 50 720 L/min linear, ...V720L... only = 720												
620 L/min with fine control range, ...E620P... only = 620												
Characteristic curve shape												
Linear = L												
Linear with linear fine control range = P												
Component series 20 to 29 = 2X (20 to 29: unchanged installation and connection dimensions)												
Pilot control valve												
Servo-valve = S												
Supply voltage 24VDC = G24												
Supply voltage ± 15VDC = G15												
Electrical connection												
Without cable socket, with component plug to DIN EN 175201-804 = K31 (separate order, see 12)												
Interfaces												
Command value ± 10 V, actual value ± 10 V = A1												
Command value ± 10 mA, actual value ± 10 mA = C1												
Sandwich plate shut-off valve												
Without shut-off valve = No code												
With shut-off valve												
De-energised shut-off valve actively opens 3WRCE from A to T when pilot pressure is applied = WK15												
De-energised shut-off valve actively opens 3WRCE from P to A when pilot pressure is applied = WL15												
Voltage supply 24 VDC, cable socket separate order, see page 12 (without connections)												
Seals												
NBR seals, suitable for mineral oils HL and HLP to DIN 51524 = M												
FKM seals = V												
Further details in clear text												

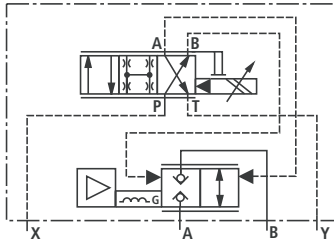
Preferred types:

Type 3WRCE	Material no.
3WRCE 32 V290L-2X/SG24K31/A1M	R900768414
3WRCE 40 V460L-2X/SG24K31/A1M	R900759110
3WRCE 50 V720L-2X/SG24K31/A1M	R900768415

Symbols: 2WRCE

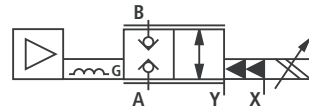
Detailed

2WRCE..-2X/S...

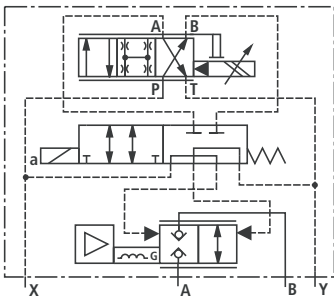


Simplified

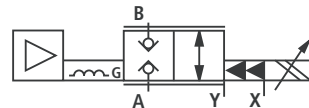
2WRCE..-2X/S...



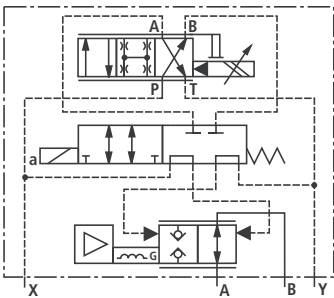
2WRCE..-2X/S...WK...



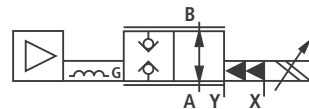
2WRCE..-2X/S...WK...



2WRCE..-2X/S...WL...



2WRCE..-2X/S...WL...



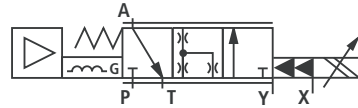
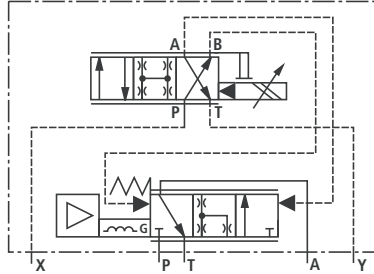
Symbols: 3WRCE

Detailed

Simplified

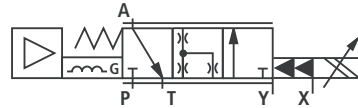
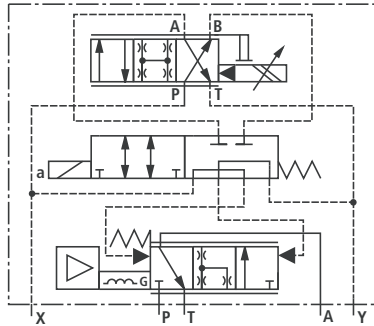
3WRCE..V...-2X/S...

3WRCE..V...-2X/S...



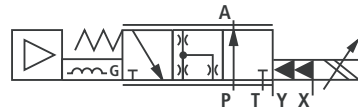
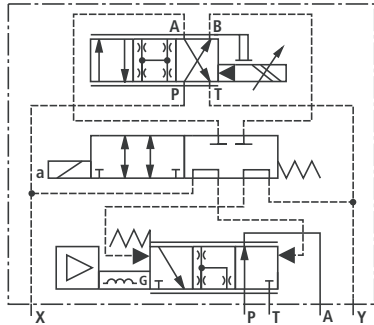
3WRCE..V...-2X/S...WK...

3WRCE..V...-2X/S...WK...



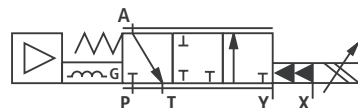
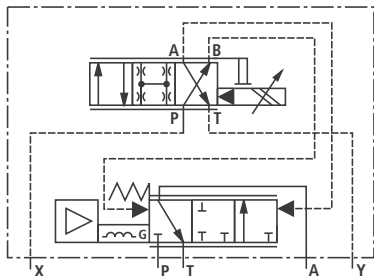
3WRCE..V...-2X/S...WL...

3WRCE..V...-2X/S...WL...



3WRCE..E...-2X/S...

3WRCE..E...-2X/S...



Structure, function and section: 2WRCE

Valves of type 2WRCE...-2X/S... are 3-stage high-response valves.

They control the amount and direction of a flow and are mainly used in closed control loops.

Structure

They consist of the following assemblies:

- 2-stage pilot control valve (1)
 - with dry torque motor
 - low-friction nozzle-flapper plate amplifier and
 - mechanical feedback of the spool position
- one main stage (2) for flow control
- an inductive position transducer (3) whose core (4) is mounted to the spool (5) of the third stage
- and integrated closed-loop control electronics (6).

Function

The integrated electronics compares command values and actual values and controls the torque motor of the pilot control valve by providing a current that is proportional to the system deviation.

The pilot control valve moves to a proportional control position and controls the flows to or from control chambers A (7) and B (8), which actuate the main spool (5) via the closed valve control loop until the system deviation becomes 0.

The stroke of the main spool is therefore controlled proportionally to the command value. Here, it must be noted that the flow also depends on the valve pressure drop.

Special valve features:

Fluid can flow through the valve from A to B or from B to A.

The spool closes or opens at a command value of 5%. In the case of smaller command values, the valve control loop tries to correct the position of the spool and consequently presses it onto the seat at up to the full pilot pressure, thus closing the connection leak-free.

The specified valve dynamics are only valid within the closed-loop control range of the valve. In the case of command value step-changes from the seated position to small opening values, additional delay times occur.

The cracking point of 5% (= 0.5 V or 0.5 mA) is factory-set. When the pilot control valve or the control electronics are replaced, the cracking point can be re-adjusted by means of zero balancing potentiometer R316, which is accessible via a plug screw.

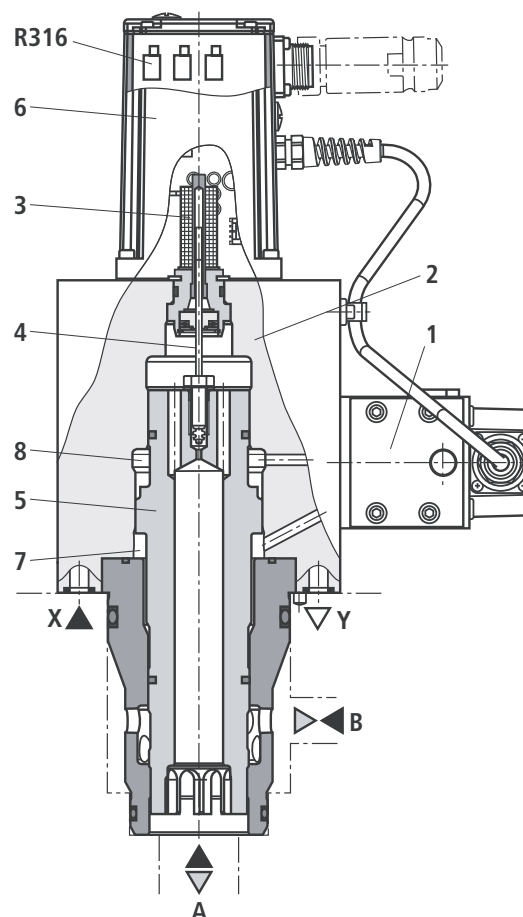
Except for zero point balancing of the controller, no adjustments are permitted on the closed-loop control electronics (= controller or open-loop control electronics) or pilot control valve in the case of a replacement.

On the pilot control valve, only the filter element may be changed (see RE 29564 for size 6 or RE 29583 for size 10).

The pilot valve is adjusted so that in the event of a power failure, it directs the pilot pressure to control chamber B (8), i.e. closes the main stage.

The control electronics is provided with an offset in order to compensate for the trimming of the pilot control valve (pilot trimming).

Due to differences in the diameter in the area around the seat, the spools are not statically pressure-compensated. To balance the difference in force, 6% of the system pressure is required as pilot pressure for spool S...L, and 22% for S...R 22%. This results in the recommended minimum control pressure with reserves for flow force and dynamics.



Structure, function and section: 3WRCE

Valves of type 3WRCE...-2X/S... are 3-stage high-response valves.

They control the amount and direction of a flow and are mainly used in closed control loops.

Structure

They consist of the following assemblies:

- 2-stage pilot control valve (1)
 - with dry torque motor
 - low-friction nozzle-flapper plate amplifier and
 - mechanical feedback of the spool position
- a main stage (2) for flow control
- an inductive position transducer (3), whose core (4) is mounted to the spool (5) of the third stage
- and integrated closed-loop control electronics (6).

Function

The integrated electronics compares command values and actual values and controls the torque motor of the pilot control valve by providing a current that is proportional to the system deviation.

The pilot control valve moves to a proportional control position and controls the flows to or from control chambers A (7) and B (8), which actuate the main spool (5) via the closed valve control loop until the system deviation becomes 0.

The stroke of the main spool is therefore controlled proportionally to the command value. Here, it must be noted that the flow also depends on the valve pressure drop.

Special valve features

The cracking point of 0 % (V-spool) is factory-set. When the pilot control valve or the control electronics are replaced, the cracking point can be re-adjusted by means of zero balancing potentiometer R316, which is accessible via a plug screw.

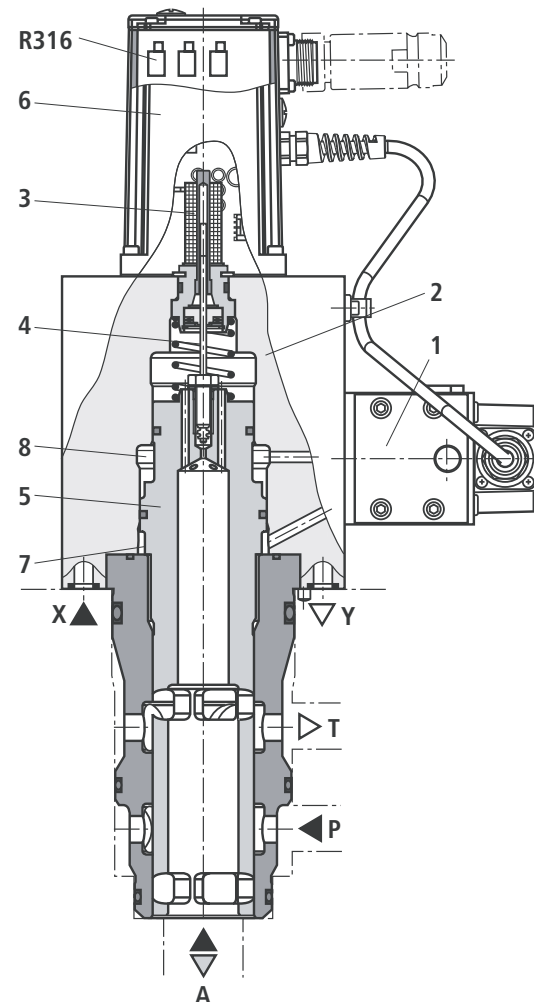
Except for zero point balancing, no adjustments are permitted on the closed-loop control electronics (= controller or open-loop control electronics) or pilot control valve in the case of a replacement.

On the pilot control valve, only the filter element may be changed (see RE 29564 for size 6 or RE 29583 for size 10).

The pilot control valve is adjusted so that in the event of a power failure the pilot pressure is applied to control chamber B (8), i.e. the main stage opens from A to T or closes the connection from P to A.

The spring behind the main spool only shifts the spool to the position, at which P to A is closed, when no pressure is applied (before installation; before re-application of pressures, e.g. after a tool change).

The control electronics is provided with an offset in order to compensate for trimming of the pilot control valve (pilot trimming).



Technical data: 2WRCE (for applications outside these parameters, please consult us!)

General

Sizes	Size	32	40	50
Installation position; commissioning		Optional, preferably horizontal; according to RE 07700		
Storage temperature range	°C	-20 ... +80		
Ambient temperature range	°C	-20 ... +60		
Weight	kg	11.2	21.1	28
Weight with shut-off valve .../...WK or .../...WL...	kg	12.4	24.8	31.7
Size of the pilot control valve	Size	6	10	10

Hydraulic (measured with HLP32, $\vartheta_{oil} = 40 \text{ °C} \pm 5 \text{ °C}$)

Max. operating pressures				
Main stage ports A, B	bar	420		
Pilot control valve port X	bar	315		
Pilot control valve port Y	bar	Pressure peaks <100, steady-state <10		
Minimum pilot pressure in % of system pressure				
with spool of version S...L	%	15		
with spool of version S...R	%	45		
Nominal flow $q_{Vnom} +10\%$ at $\Delta p = 5 \text{ bar}$				
Version ...S...L (linear)	L/min	650	1000	1600
Version ...S...R (linear with progressive fine control range)	L/min	480	700	1100
Max. flow	with spool ...S...L	L/min	1500	2200
	with spool ...S...R	L/min	2000	3000
Pilot flow to X and Y with step-like input signal from 0 to 100 % (315 bar)	L/min	38	56	80
	L/min	$\sqrt{\frac{P_x}{70 \text{ bar}} \cdot 0.5}$	$\sqrt{\frac{P_x}{70 \text{ bar}} \cdot 1.2}$	
Pilot oil flow	cm ³	4.52	8.48	17.3
Nominal stroke	mm	10	12	15
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524, further hydraulic fluids on enquiry		
Hydraulic fluid temperature range	°C	-20 ... +80; preferably +40 ... +50		
Viscosity range	mm ² /s	20 ... 380; preferably 30 ... 45		
Max. permissible degree of contamination of the hydraulic fluid according to ISO 4406 (c)				
Cleanliness class to ISO code	Pilot control valve	Class 18/16/13 ¹⁾		
	Main valve	Class 20/18/15 ¹⁾		
Hysteresis	%	≤ 0.2		
Range of inversion	%	≤ 0.1		
Response sensitivity	%	≤ 0.1		
Closing time when using (for pilot pressures from 40 to 315 bar)	pilot trimming	ms	≤ 550	
	sandwich plate shut-off valve	ms	≤ 200	

¹⁾ The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and at the same time increases the service life of components. For the selection of filters, see data sheets: RE 50070, RE 50076, RE 50081; RE 50086 and RE 50088

Technical data: 2WRCE (for applications outside these parameters, please consult us!)

Electrical

Sizes	Size	32	40	50
Type of protection of the valve to EN 60529		IP65 with cable socket mounted and locked		
Type of voltage		DC voltage		
Type of signal		Analogue		
Cracking point balancing	%	≤ 1		
Zero drift in the case of changes in:				
Hydraulic fluid temperature	%/10 K	≤ 0.3	≤ 0.3	≤ 0.3
Pilot pressure in X	%/100 bar	≤ 0.7	≤ 0.7	≤ 0.7
Return line pressure in Y 0 to 10% of p_x	%/bar	≤ 0.3	≤ 0.3	≤ 0.3

Note!

For details regarding environment simulation testing in the fields of EMC (electromagnetic compatibility), climate and mechanical stress, see RE 29136-U (declaration on environmental compatibility).

Integrated electronics (OBE) of type VT 13037

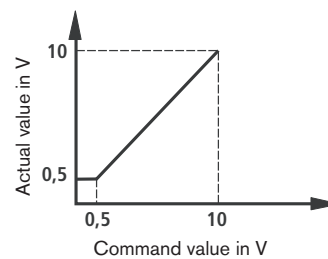
Nominal command value range for 2WRCE:
0 to +10 V (mA) \triangleq 0 to 100 %

Within the command value range from 0 to +0.5 V the actual value remains constant at 0.5 V.

In the case of slow changes in the command value from +0.5 V to +10 V the actual value follows the command value within ± 0.1 V.

With command values above +10 V the actual value follows up to approx. +12 V.

In the case of a command value step-change to +10 V, the actual value can briefly take values up to approx. +10.5 V.



Technical data: 3WRCE (for applications outside these parameters, please consult us!)

General

Sizes	Size	32	40	50
Installation position; commissioning		Optional, preferably horizontal; according to RE 07700		
Storage temperature range	°C	-20 ... +80		
Ambient temperature range	°C	-20 ... +60		
Weight	kg	11.5	18.9	29.2
Weight with shut-off valve/...WK or .../...WL...	kg	12.7	20.1	32.9
Size of the pilot control valve	Size	6	6	10

Hydraulic (measured with HLP32, $\vartheta_{oil} = 40 \text{ °C} \pm 5 \text{ °C}$)

Max. operating pressures				
Main stage ports P, A, T	bar	315		
Pilot control valve port X	bar	315		
Pilot control valve port Y	bar	Pressure peaks <100, steady-state <10		
Nominal flow $q_{Vnom} +10\%$ at $\Delta p = 5 \text{ bar}$				
Version ...V...L (linear)	L/min	290	460	720
Max. flow	L/min	900	1400	2200
Pilot flow to X and Y with step-like input signal from 0 to 100 % (315 bar)	L/min	27	42	65
Max. zero flow of the main stage, $p_p = 300 \text{ bar}$	L/min	4	6	8
Zero flow of the servo pilot stage in dependence upon the pressure in X	L/min	$\sqrt{\frac{p_x}{70 \text{ bar}}} \cdot 0.5$		$\sqrt{\frac{p_x}{70 \text{ bar}}} \cdot 1.2$
Pilot flow	cm ³	±2.26	±4.24	±8.65
Nominal stroke	mm	±5	±6	±7.5
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524		
Hydraulic fluid temperature range	°C	-20 ... +80; preferably +40 ... +50		
Viscosity range	mm ² /s	20 ... 380; preferably 30 ... 45		
Max. permissible degree of contamination of the hydraulic fluid to ISO 4406 (c)				
Cleanliness class to ISO code	Pilot control valve	Class 18/16/13 ¹⁾		
	Main valve	Class 20/18/15 ¹⁾		
Hysteresis	%	≤ 0.2		
Range of inversion	%	≤ 0.1		
Response sensitivity	%	≤ 0.1		
Closing time from 100% opening down to zero flow using pilot trimming	ms	≤ 500		
Sandwich plate shut-off valve (for pilot pressures from 40... 315 bar)	ms	≤ 200		

¹⁾ The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and at the same time increases the service life of components. For the selection of filters, see data sheets: RE 50070, RE 50076, RE 50081; RE 50086 and RE 50088

Technical data: 3WRCE (for applications outside these parameters, please consult us!)

Electrical

Sizes	Size	32	40	50
Type of protection of the valve to EN 60529		IP65 with cable socked mounted and locked		
Type of voltage		DC voltage		
Type of signal		Analogue		
Zero balancing	%	≤ 1		
Zero drift in the case of changes in:				
Hydraulic fluid temperature	%/10 K	≤ 0.3	≤ 0.3	≤ 0.3
Pilot pressure in X	%/100 bar	≤ 0.7	≤ 0.7	≤ 0.7
Return line pressure in Y (0 to 10% of p_y)	%/bar	≤ 0.3	≤ 0.3	≤ 0.3

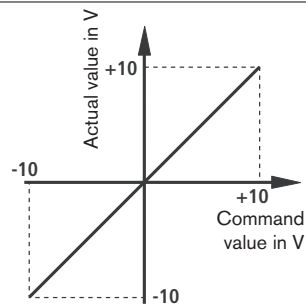
Integrated electronics (OBE) type VT 13037

Nominal command value range for 3WRCE:
0 to ±10 V (mA) \triangleq 0 to ±100 %

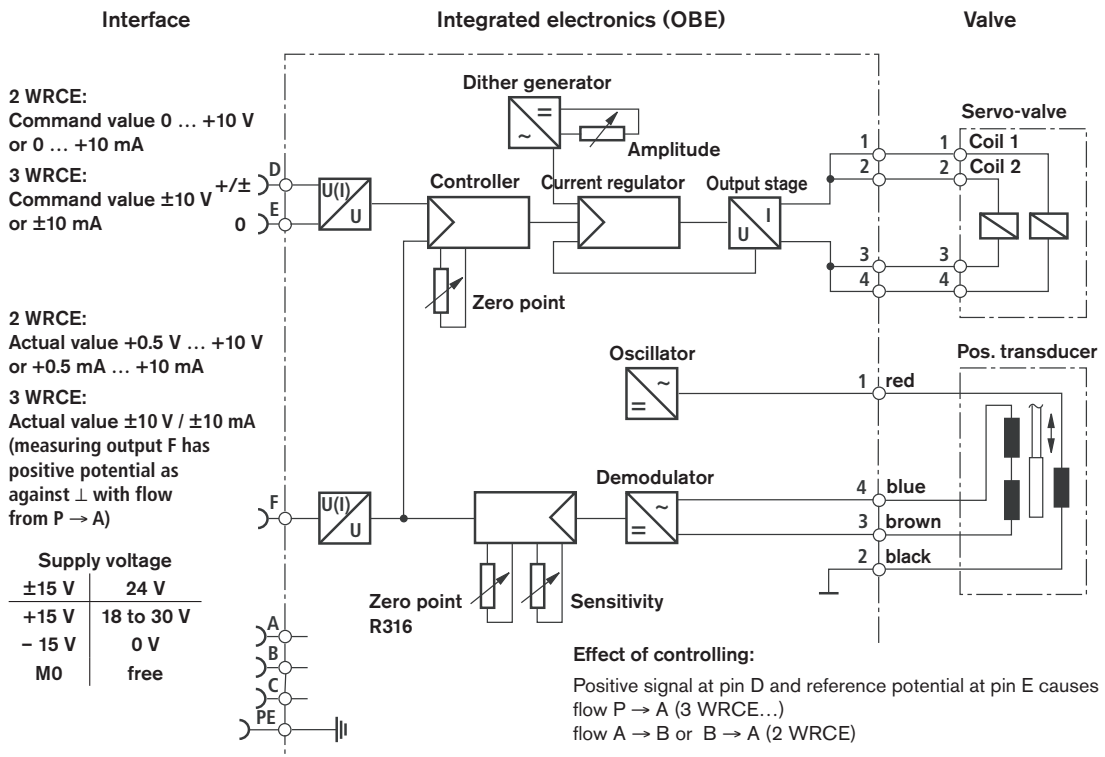
In the case of slow changes in the command value from 0 V to ±10 V the actual value follows the command value within ±0.1 V.

With command values above ±10 V the actual values follows up to approx. ±13 V.

With a command value step-change to ±10 V, the actual value can briefly take values up to approx. ±10.5 V.



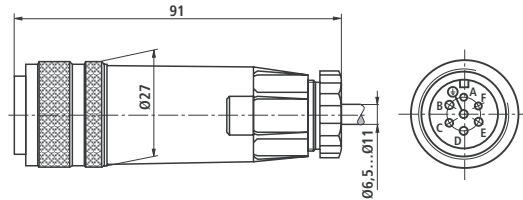
Block circuit diagram of integrated electronics (OBE) type VT13037



Electrical connection, cable sockets

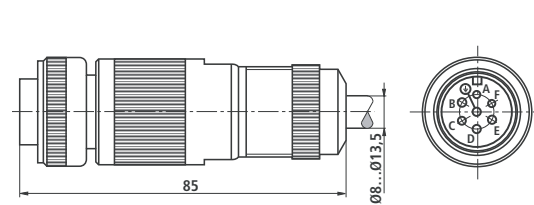
Cable socket

Cable socket to DIN EN 175201-804
separate order stating material no. **R900021267**
(plastic version)



Cable socket

Cable socket to DIN EN 175201-804
separate order stating material no. **R900023890**
(metal version)



Component plug pin assignment	Pin	Pin assignment of interface A1 (Voltage supply "G15" in brackets)		Pin assignment of interface C1 (Voltage supply "G15" in brackets)	
		2WRCE	3WRCE	2 WRCE	3WRCE
Supply voltage	A	+24 VDC	(+15 VDC)	+24 VDC	(+15 VDC)
	B	0 VDC	(-15 VDC)	0 VDC	(-15 VDC)
M0 at ±15V "G15"	C	n.c. (reference to pins A, B)		n.c. (reference to pins A, B)	
Differential command value input	D	0 ... +10 V	0 ... ±10 V	0 ... +10 mA	0 ... ±10 mA
	E				
Actual value Reference for "G24" is pin B Reference for "G15" is pin C	F	+0.5 ... +10 V	0 ... ±10 V	+0.5 ... +10 mA	0 ... ±10 mA
Protective ground	PE	Connected to valve housing		Connected to valve housing	

Do not connect PE, if the valve is already grounded via the system.

Supply voltage: +24 VDC ±6 V; full-bridge rectification with smoothing capacitor 2200 µF = $I_{max} = 230$ mA
±15 VDC ±0.45 V; stabilised and smoothed; $I_{max} = 180$ mA

Command value current: 0 ... +10 mA or ±10 mA → input resistance 100 Ω

Actual value current: 0.5 mA ... +10 mA or ±10 mA → max. load resistance 1 kΩ
Command value and actual value have the same polarity

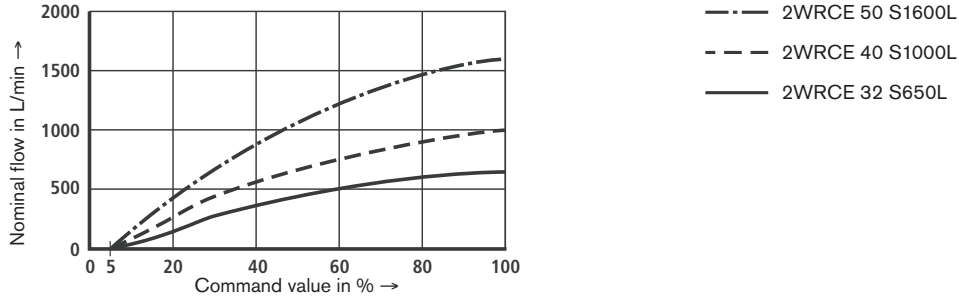
Note: Electrical signals brought out via control electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions!
(See also European standard "Safety requirements for fluid power systems and components – hydraulics", EN 982!)

Cable sockets for shut-off valve to DIN EN 175301-803 for component plug "K4"

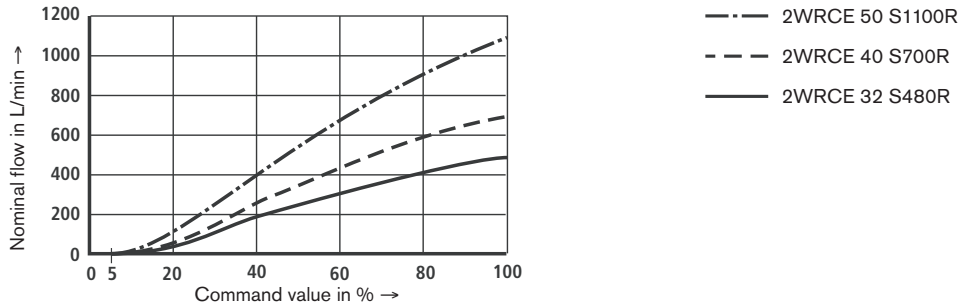
For further cable sockets, see RE 08006					
		Material no			
Valve side	Colour	Without circuitry	With lamp 12 ... 240 V	With rectifier 12 ... 240 V	With lamp and Z-diode protective circuitry 24 V
a	grey	R901017010	–	–	–
a/b	black	–	R901017022	R901017025	R901017026

Characteristic curves (measured with HLP32, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$)

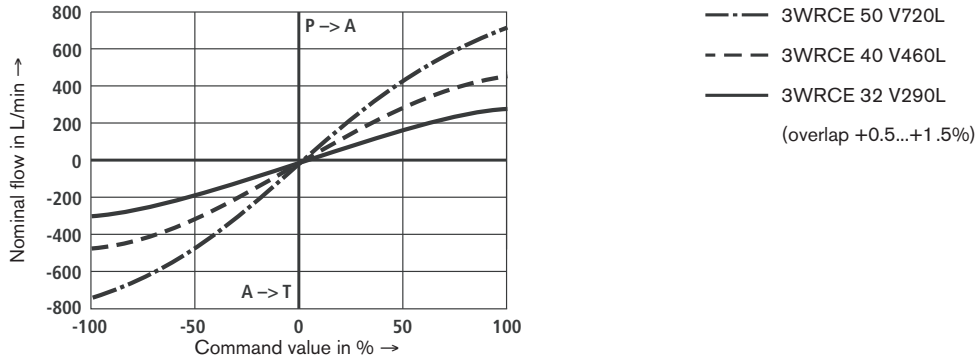
Nominal flow at 5 bar valve pressure differential A → B = B → A



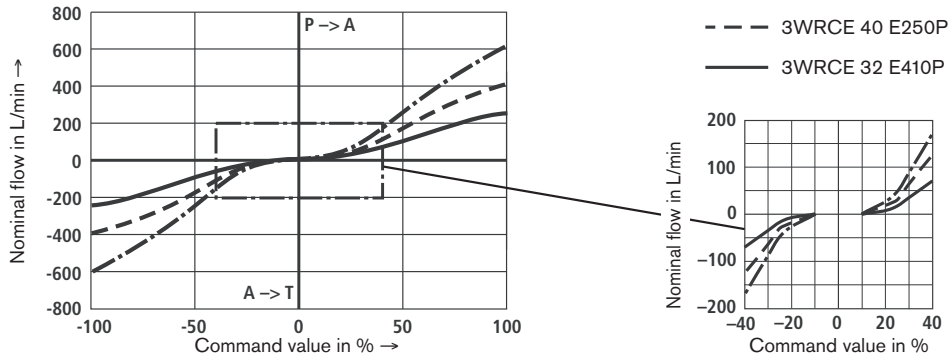
Nominal flow at 5 bar valve pressure differential A → B = B → A



Nominal flow at 5 bar valve pressure differential

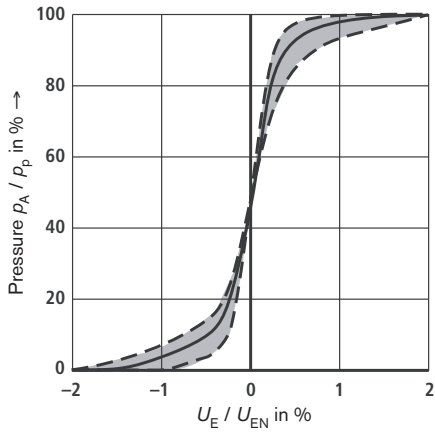


Nominal flow at 5 bar valve pressure differential with 10% overlap



Characteristic curves (measured with HLP32, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$)

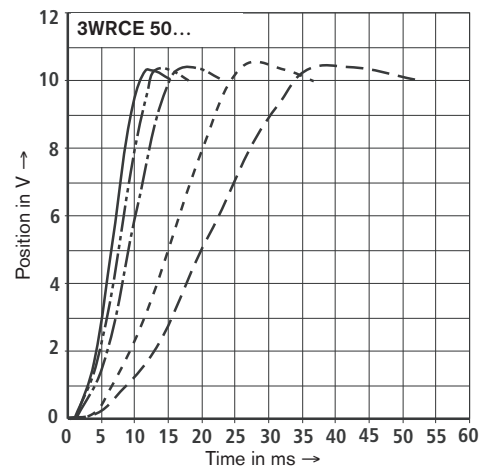
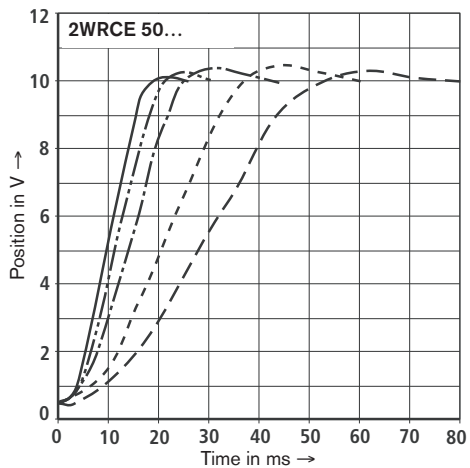
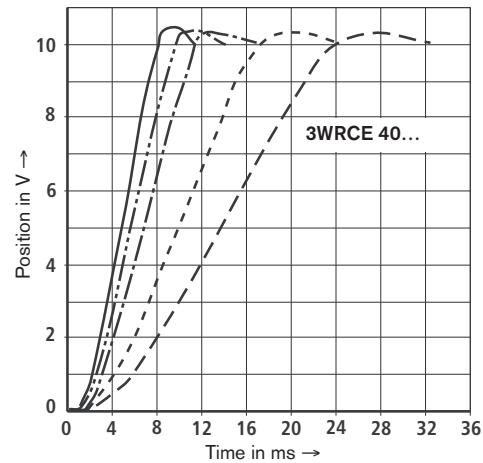
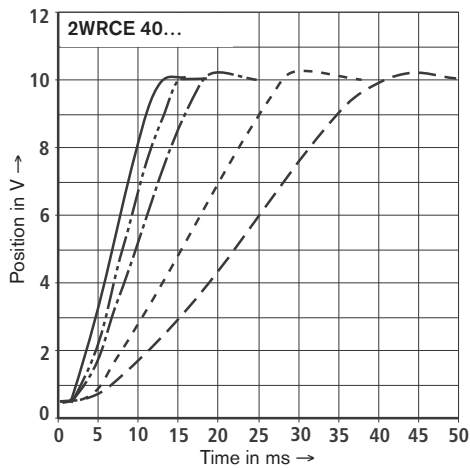
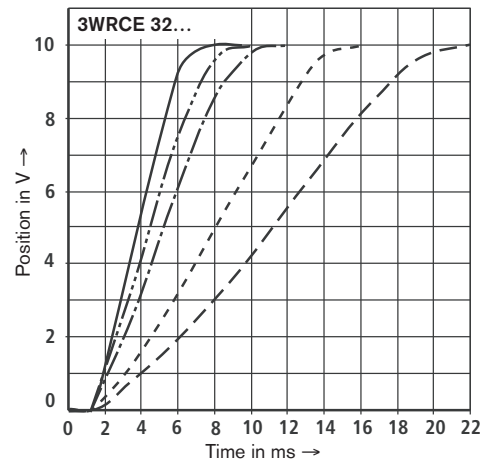
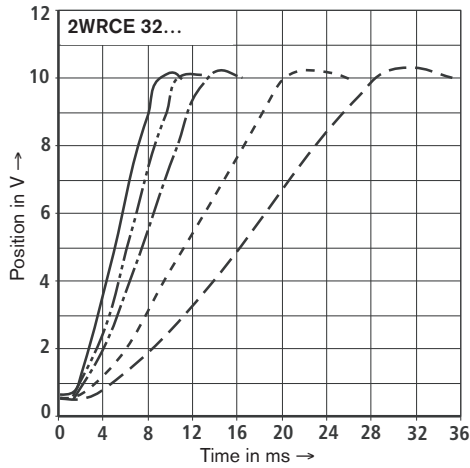
Pressure/signal function with 3WRCE...V... limit and average value curves



Characteristic curves (measured with HLP32, $\vartheta_{oil} = 40\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$)

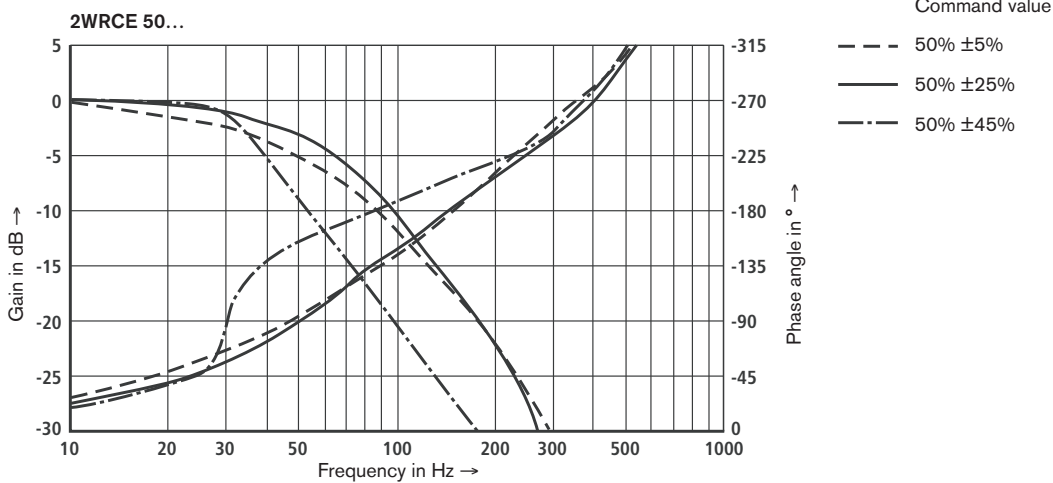
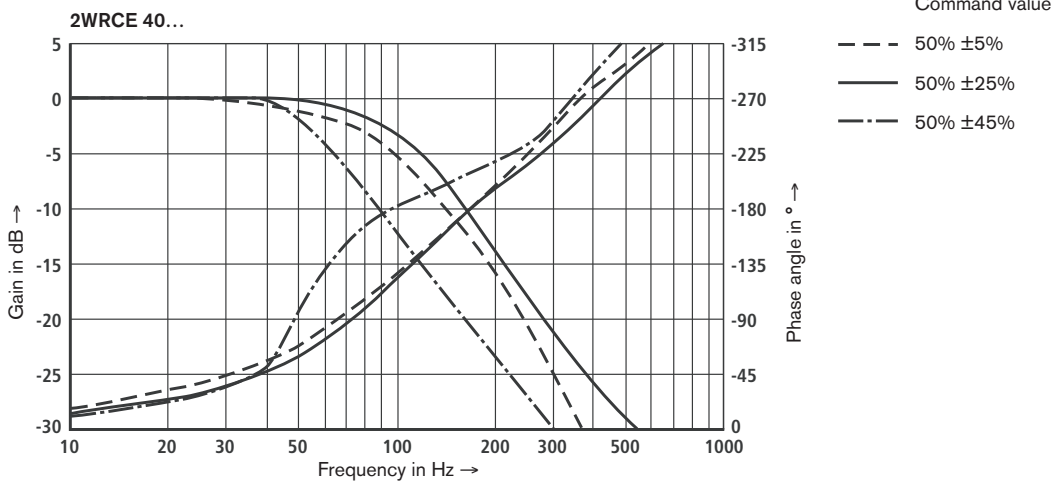
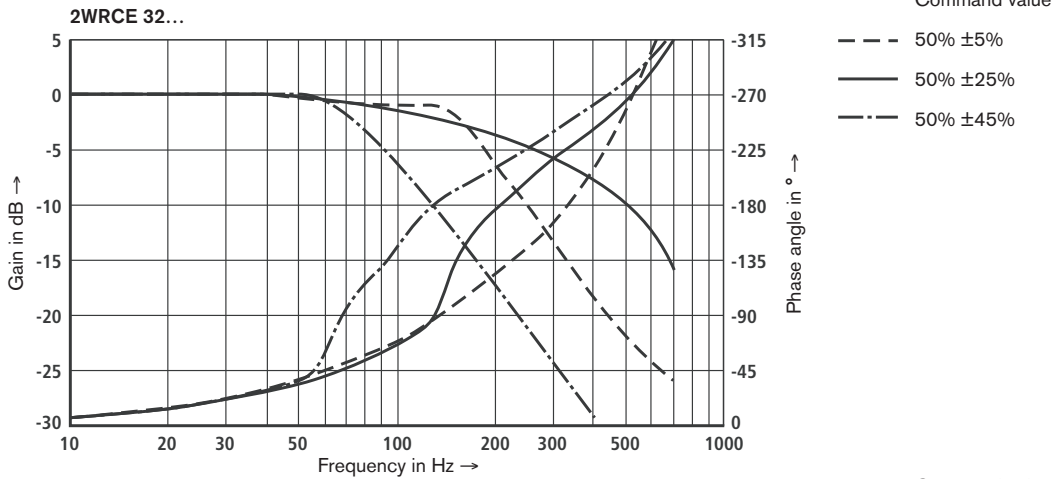
Transient function

--- 40 bar, - - - - 70 bar, - · - · 140 bar, - · - · 210 bar, — 315 bar



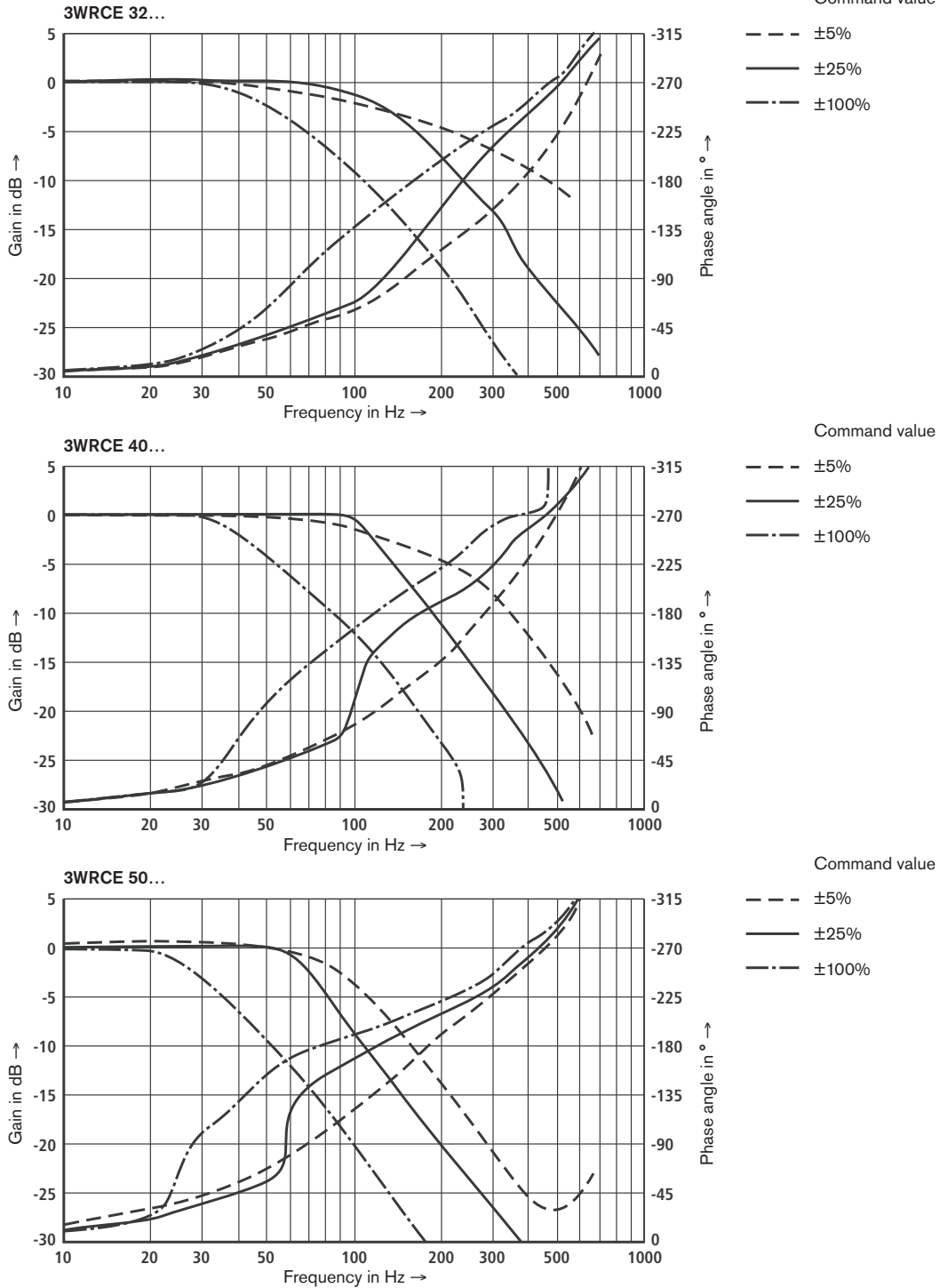
Characteristic curves (measured with HLP32, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$)

Frequency response at $p_p = 315\text{ bar}$



Characteristic curves (measured with HLP32, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$)

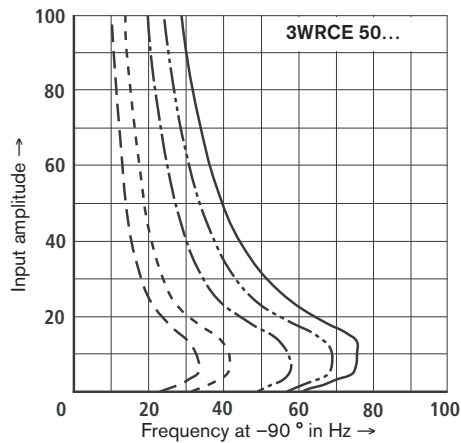
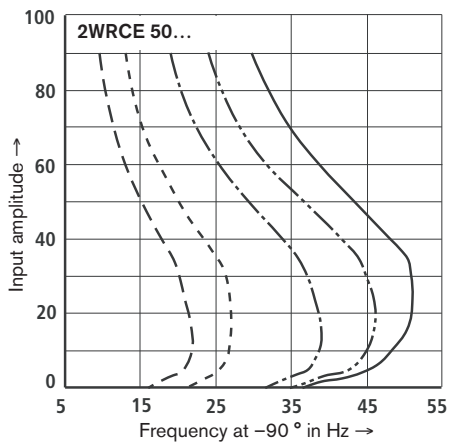
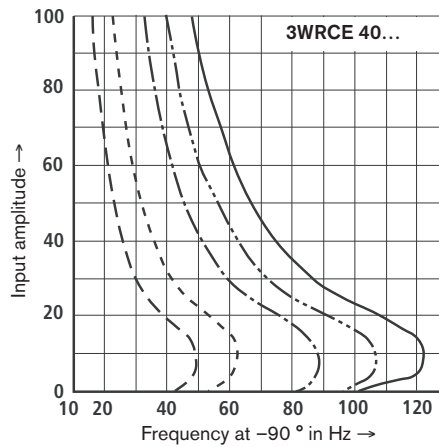
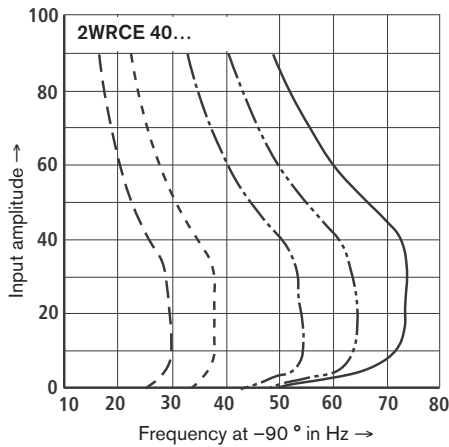
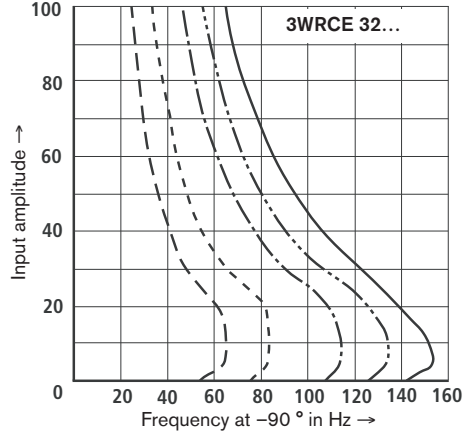
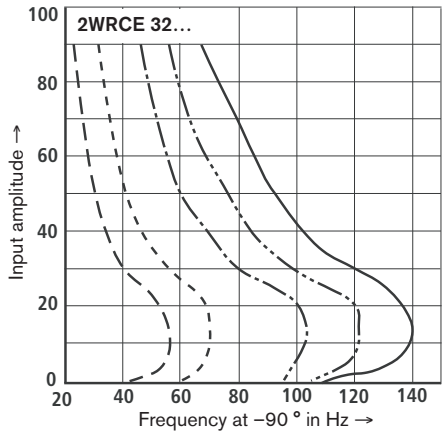
Frequency response at $p_p = 315\text{ bar}$



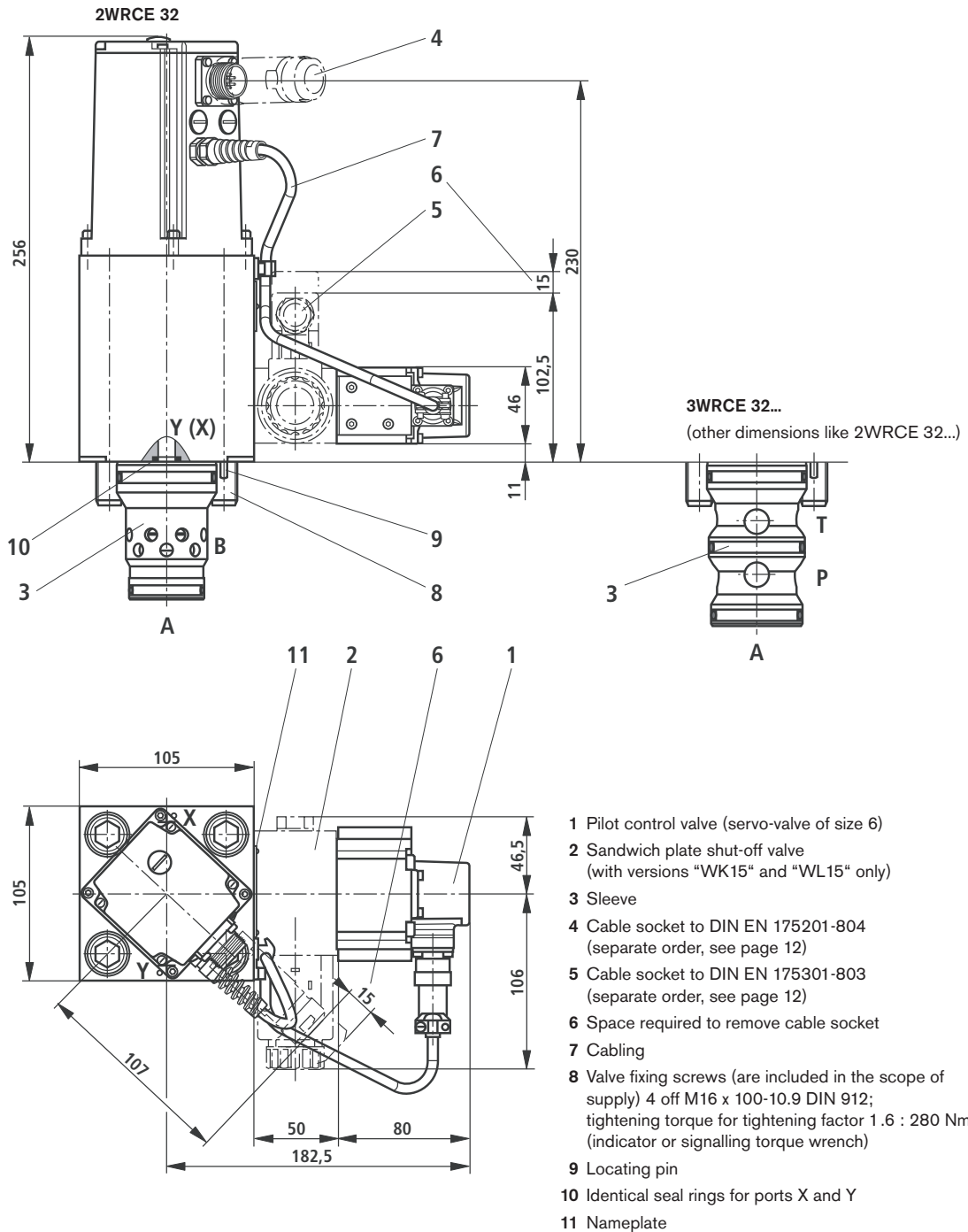
Characteristic curves (measured with HLP32, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$)

Dependence of frequency f at -90° on operating pressure and input amplitude

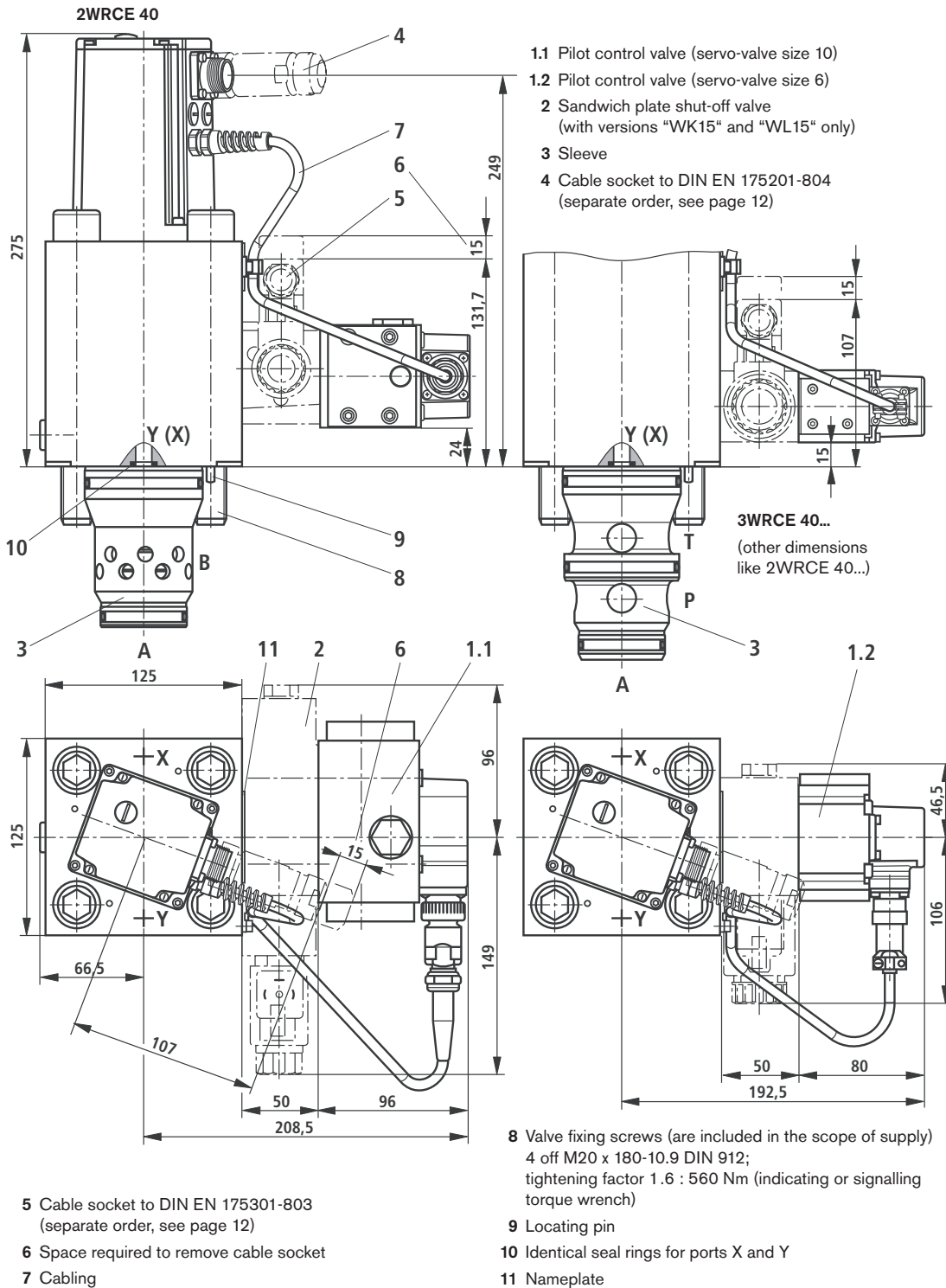
- - - $p_{st} = 40\text{ bar}$
- · - · $p_{st} = 140\text{ bar}$
— $p_{st} = 315\text{ bar}$
- - - $p_{st} = 70\text{ bar}$
- · - · $p_{st} = 210\text{ bar}$



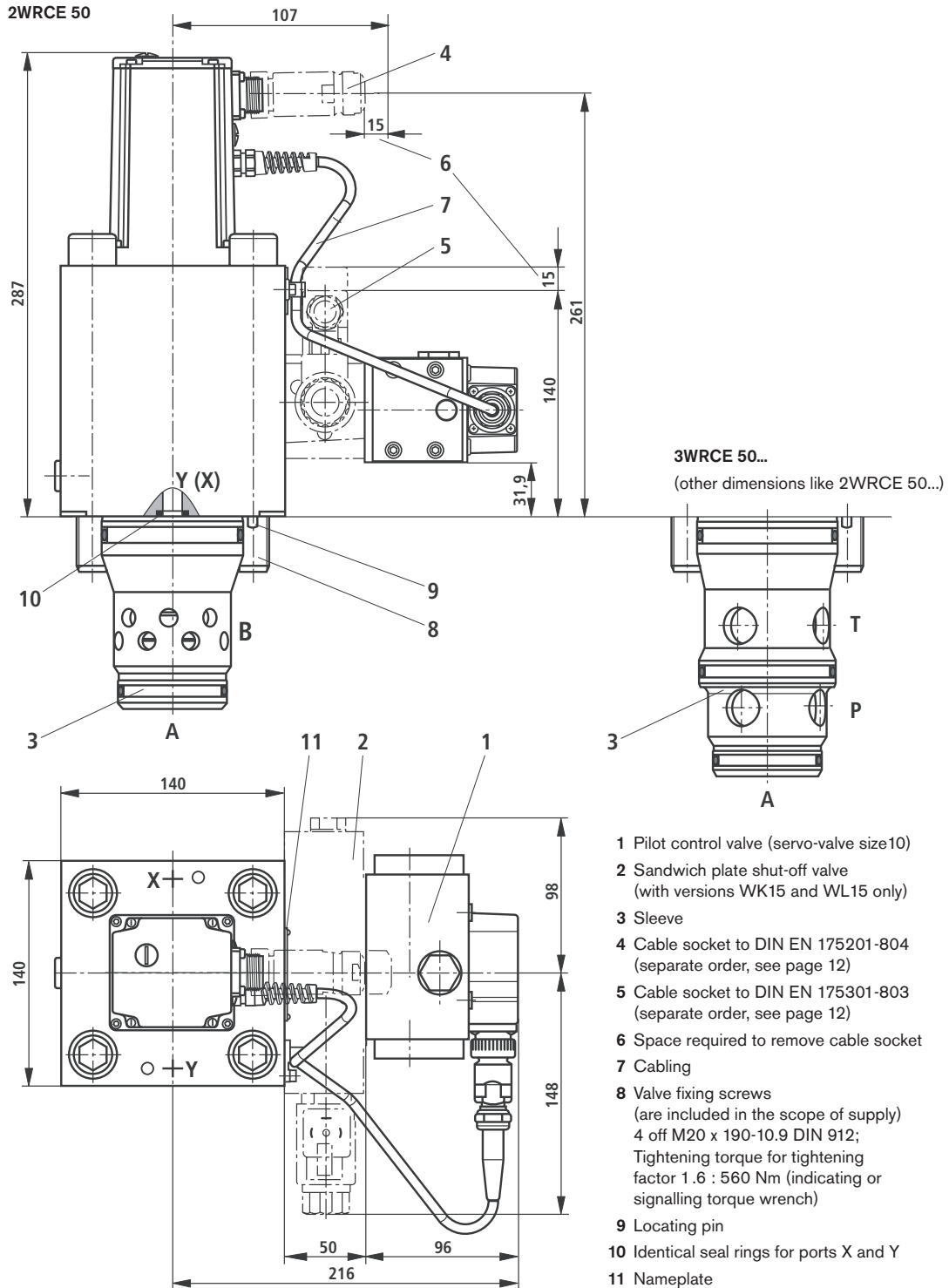
Unit dimensions: 2WRCE and 3WRCE, size 32 (nominal dimensions in mm)



Unit dimensions: 2WRCE and 3WRCE, size 40 (nominal dimensions in mm)



Unit dimensions: 2WRCE and 3WRCE, size 50 (nominal dimensions in mm)



Notes

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