HYDRECO
a member of DAIKIN group

KCB*

LOAD HOLDING VALVES, CARTRIDGE

KCB08	max 350 bar	30 l/min
KCB10	max 350 bar	60 l/min
KBC1S	max 350 bar	60 l/min
KBC4S	max 350 bar	150 l/min

TECHNICAL CATALOGUE

KCB_2023_01

INTRODUCTION

They control the movement of a hydraulic actuator (cylinder or motor), specifically:

- Safe locking of actuator with directional valve in idle position (or with pump stopped).
- Controlled movements of the actuator when the load is descending. Due to the presence of the pilot line, the velocity of the actuator is always due to the flow rate from the pump, even in the case of dragging load, cavitation phenomena that can cause serious accidents due to loss of control are avoided.
- They limit the maximum pressure in the service due to any shocks, overloads or abrupt maneuvers.
- They allow free rise of the load thanks to a built-in one-way valve.

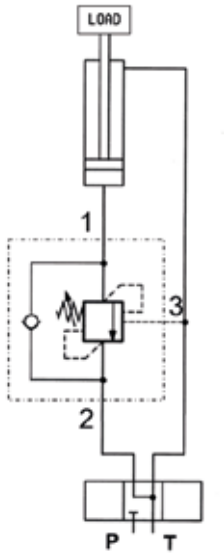


FIGURE 1

Typical use of a counterbalance valve to control the descent of a load.

FLUIDS

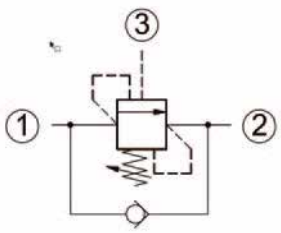
Mineral oil based hydraulic fluids HL (DIN 51524 part 1) or HLP (din 51524 part 2).
The performance curves are obtained using mineral based fluid ISO VG 46 with an oil temperature of 30-40 °C.

KCB OPERATING PARAMETERS

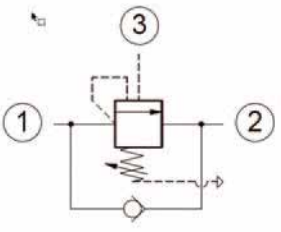
MAXIMUM OPERATING PRESSURE		350 bar	5000 psi
LOAD PRESSURE			
FLOW CAPACITY	S	60 l/min	gpm
	R	30 l/min	10.6 gpm
	F	15 l/min	
	U	4 l/min	
CAVITY	KCB08	SAE08	
	KCB10	SAE10	
	KCB1S	T11A	
	KCB4S	T2A	
TEMPERATURES:	fluid	-30 to +100 °C	- 22 to +212 °F
FLUID VISCOSITY	range	10 - 500 cSt	SUS
	recommended	25 cSt	120 SUS
FLUID CONTAMINATION		ISO 4406:1999 class 19/17/14	

HYDRAULIC SYMBOLS

normal



vented



NOTE: here shown the version with variable adjustment

PILOT RATIO

The quotient of the active area on the pilot line and the active area of the valve acting as a pressure limiter defines the pilot ratio R of the counterbalance valve:

$$R = \frac{\text{pilot area}}{\text{relief area}}$$

With reference to Figure 1, during descent, the pressure acting on the rod side of the cylinder also acts on the pilot line (3) of the valve, aiding its opening.
Load-induced pressure also pushes the cylinder downward.
We call the pressure on the port (3) P_P, the load-induced pressure P_C, the setting pressure of the valve P_{TAR} and the pilot ratio R.
Neglecting back pressure, for a scheme as in Figure 1, we have that the minimum pressure required to operate the valve descent P_P is:

$$P_P = \frac{P_{TAR} - P_C}{R}$$

Example:
valve set to P_{TAR} = 350 bar, load-induced pressure P_C = 250 bar, pilot ratio 4:1 (R = 4).

$$P_P = \frac{350 - 250}{4} = 25\ bar$$

VALVES IN NORMAL AND VENTED DESIGN

Due to the construction geometry, a normal counterbalance valve is strongly affected by back pressure at the port (2).
If this pressure is not zero, then the pilot pressure in the previous example should be fixed with:

$$P'_P = P_P + P_2 \cdot \frac{R+1}{R}$$

In addition, the pressure will be relieved to an upper value that can be calculated by:

$$P_R = P_{TAR} + P_2 \cdot (R+1)$$

If in the example above we had a back pressure of P_2 = 20 bar, then:

$$P'_P = 25 + 20 \cdot \frac{4+1}{4} = 50\ bar$$

While the valve set at 350 bar would relief the pressure to:

$$P_R = 350 + 20 \cdot (4+1) = 450\ bar$$

PRESSURE SETTING

For the pressure relief function, the valve must remain closed even when the utility is subjected to the maximum load allowed by the application (P_{max}).

For this purpose, it is generally required that the set pressure is at least 30% more than the pressure induced by the maximum permissible load, thus: $P_t \geq 1.3 \cdot P_{max}$

AVAILABLE SETTING

Valves are supplied in various sizes, in SAE or SUN cavities.
Each size currently available (SAE 08, SAE 10, SUN T11A, SUN T2A) consists of several versions (normal or vented design), with different pilot ratios, fixed or variable pressure settings, and with different Q – ΔP characteristics (from the most restrictive for particularly fine movements to the largest openings the size can allow). In the next page will follow most standards pdoducts.

All the various combinations available will be included in the catalog.

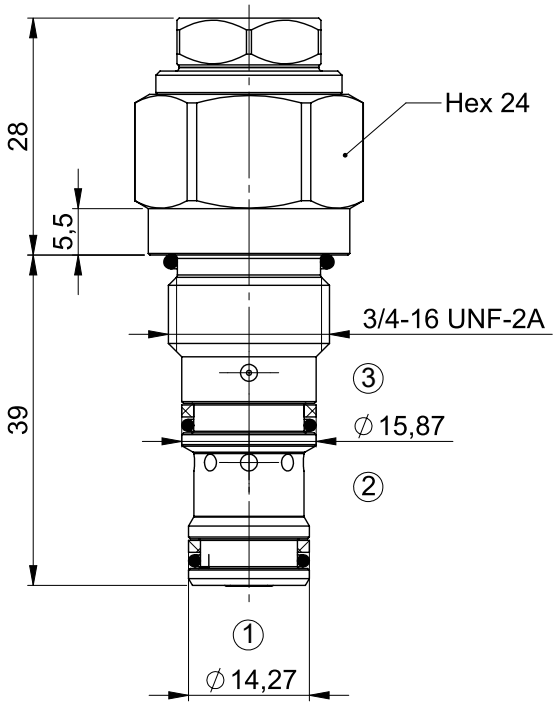
For special needs, we recommend contacting HYDRECO.

If this is not acceptable, there is the vented version that makes the counterbalance valve completely insensitive to back pressure because the spring is vented in air.
Such valves are commonly used in directional control valves with services locked in the idle position, with antishock auxiliary valves on the ports; typical use cases are:

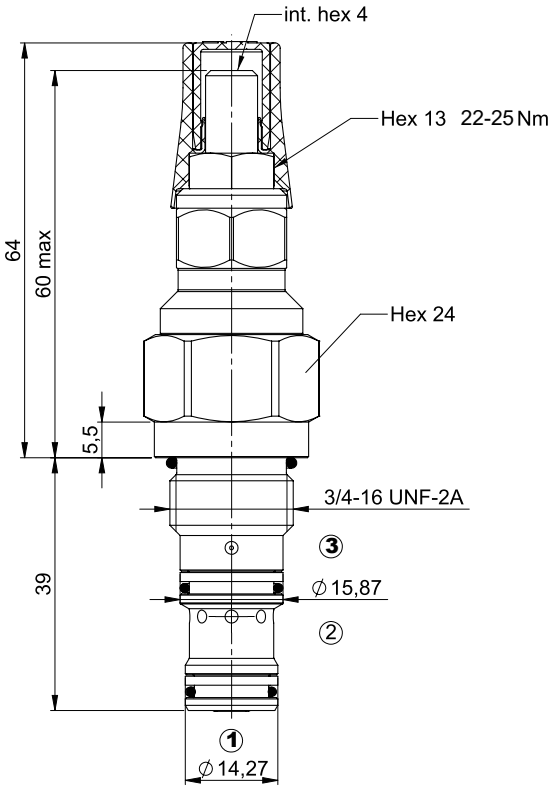
1. Counterbalance valves operating with limited pilot pressures, or in the presence of back pressure (example: regenerative circuits or with actuators connected in series).
2. Progressive and stable opening is required in the presence of oscillating back pressure.
3. Counterbalance valves with openings piloted directly by hydraulic joystick pressure.

KCB08 (SAE 08 cavity)

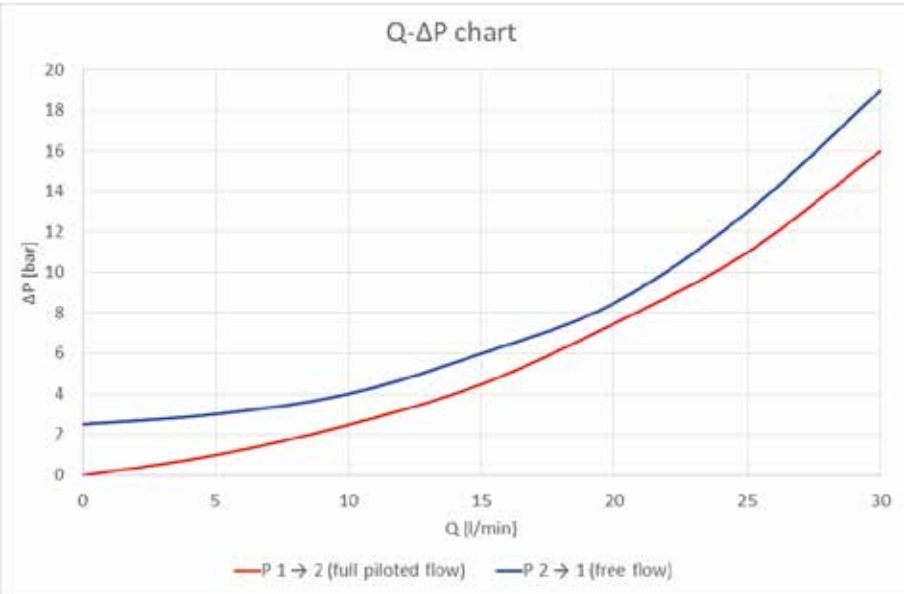
Fixed setting



Variable pressure setting

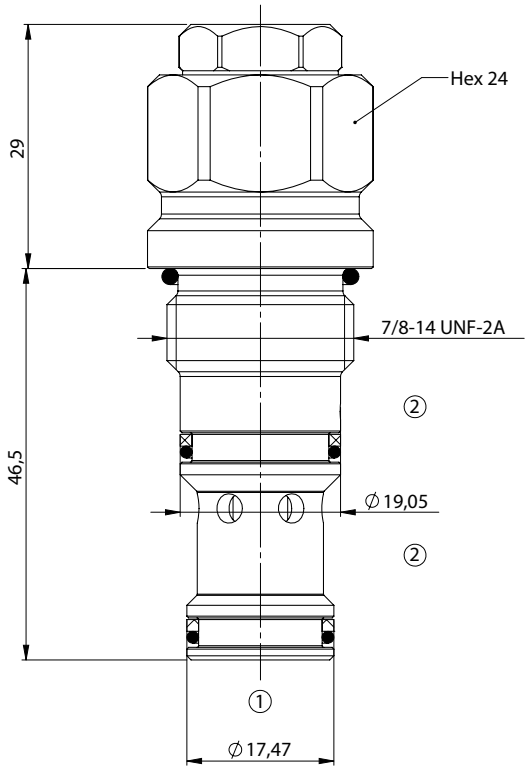


Q-ΔP characteristic

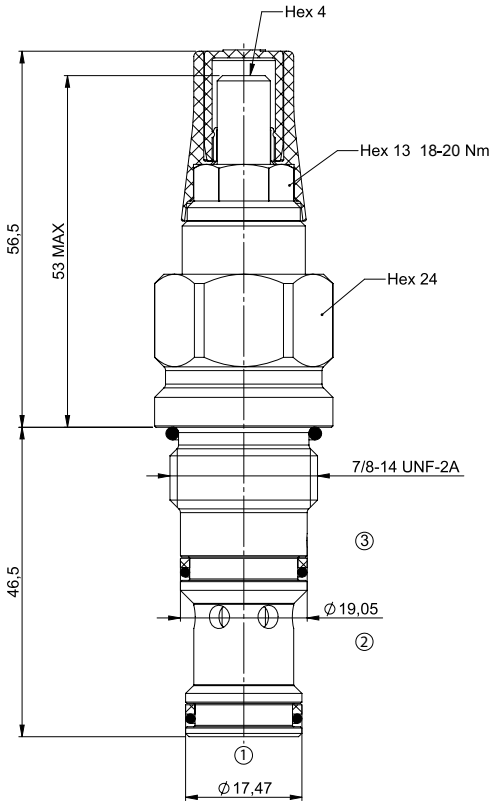


KCB10 (SAE 10 cavity)

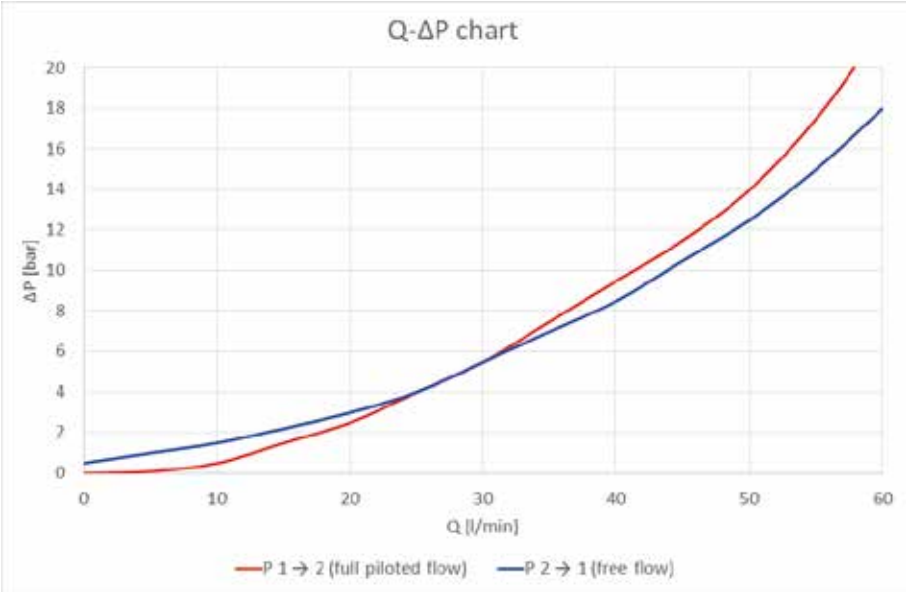
Fixed setting



Variable pressure setting

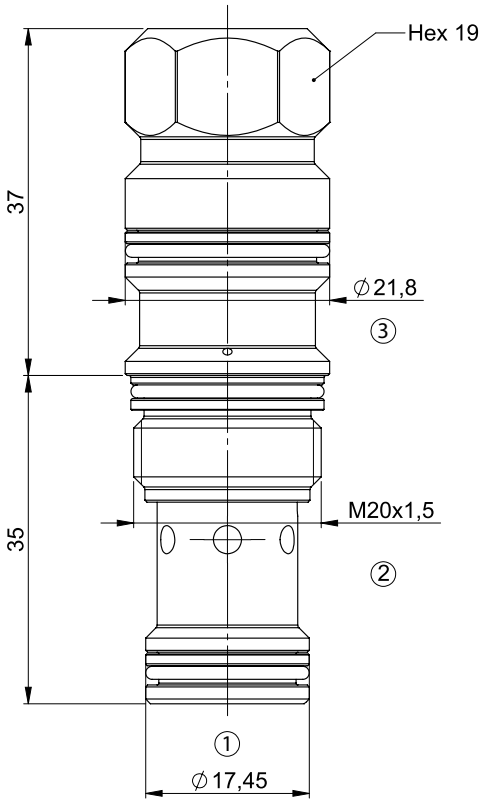


Q-ΔP characteristic

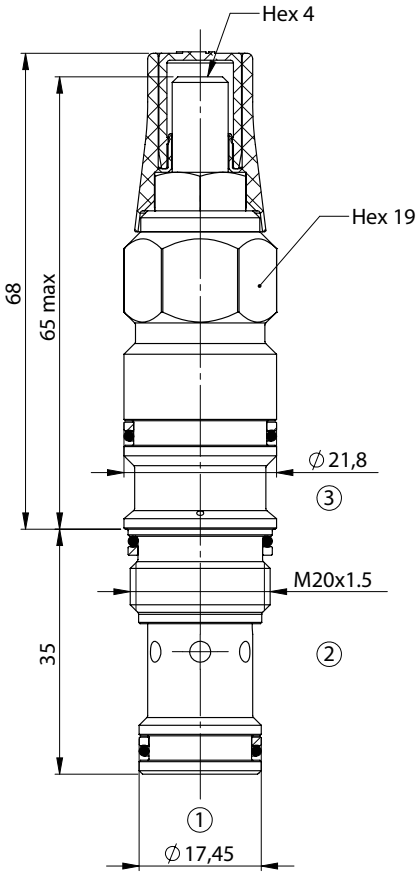


KCB1S (SUN T11A cavity)

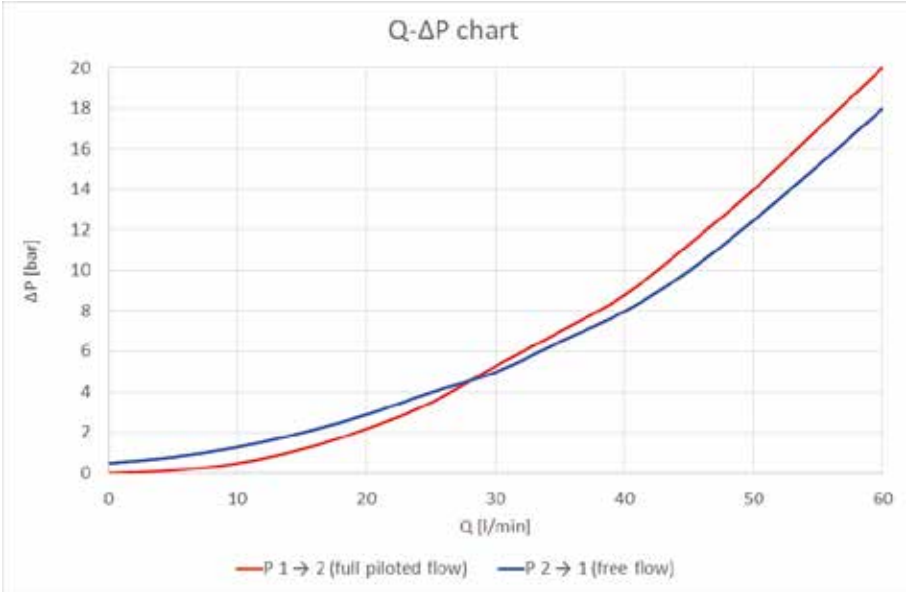
Fixed setting



Variable pressure setting

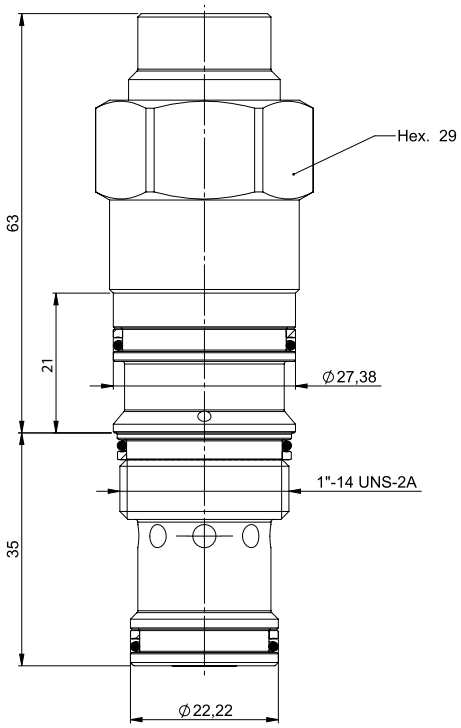


Q-ΔP characteristic

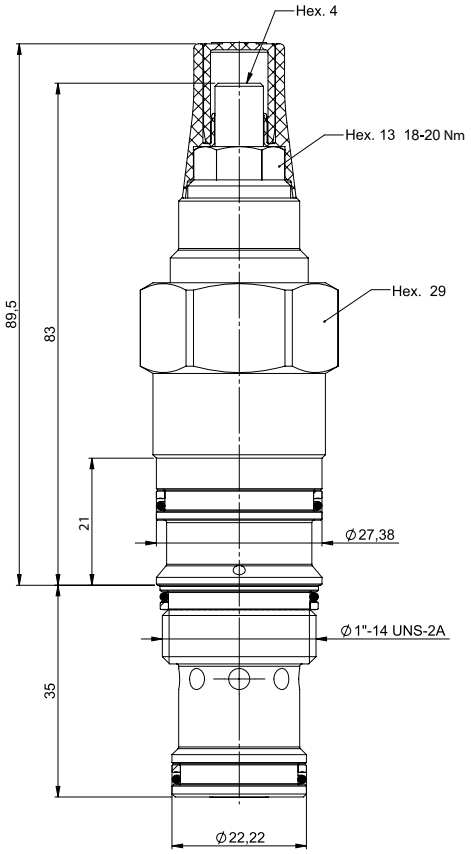


KCB4S (SUN T2A cavity)

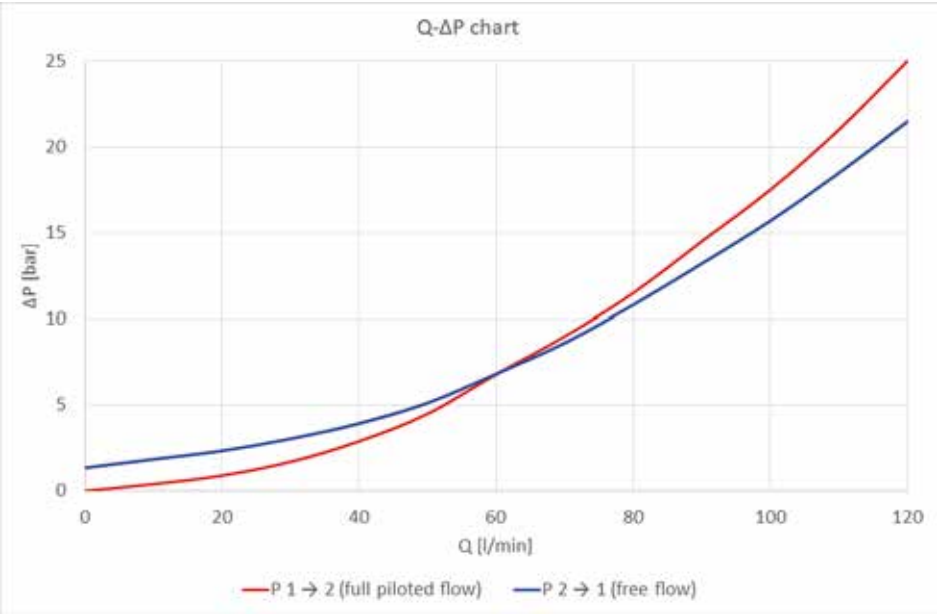
Fixed setting



Variable pressure setting



Q-ΔP characteristic



CARTRIDGES FOR SAE CAVITY

KCB ☐☐ - ☐☐ N ☐ - ☐ - ☐ -1 ← design mark

CAVITY	
08	3/4”-16 UNF
10	7/8”-14 UNF

ADJUSTMENT	
V	variable
F	fixed

PILOT RATIO	
3	3:1 (*)
4	4:1 (**)
8	8:1

* only for 10
** only for 08

MAX FLOW (see table for actual availability)	
H	max flow 60 l/min (*)(**)
S	max flow 30 l/min (**std**)
F	max flow 15 l/min (*)
U	max flow 4 l/min (*)

* available only for cartridges with pilot ratio 4
** only for 10

SEAL	
N	NBR (**standard**)
V	Viton

PRESSURE SETTING	
——	only for ratio 4:1 030 to 350 bar (*)
——	only for ratio 8:1 140 to 350 bar (*)
——	only for ratio 3:1 030 to 350 bar (**)
——	only for ratio 8:1 070 to 350 bar (**)

* only for size 08
** only for size 10

SCHEME	
N	normal

CODE EXAMPLES:

KCB08-V070N4-F-N-1
KCB08-V210N8-S-N-1
KCB10-V030N3-S-N-1

CARTRIDGES FOR SPECIAL CAVITIES

KCB4S- ☐☐ N4 - S - ☐ - 1 ← design mark

CAVITY	
4S	SUN T2A

ADJUSTMENT	
V	variable
F	fixed

PILOT RATIO	
4	4:1

MAX FLOW	
S	max flow 120 l/min
X	max flow 150 l/min

SEAL	
N	NBR (**standard**)
V	Viton

PRESSURE SETTING	
__	070 to 350 bar

SCHEME	
N	normal

CODE EXAMPLES:

KCB10-V030N3-N-1
KCB10-V210N8-N-1

CARTRIDGES FOR SPECIAL CAVITIES

KCB 1S- [ ][ ] N [ ] - [ ] - [ ] -1 — design mark

CAVITY	
1S	SUN T11A

ADJUSTMENT	
V	variable
F	fixed

PRESSURE SETTING	
——	only for ratio 3 and 4 040 to 350 bar
—	only for ratio 8:1 070 to 350 bar
—	only for ratio 10:1 070 to 350 bar

SCHEME	
N	normal
V	vented

PILOT RATIO	
3	3:1
4	4:1
8	8:1
10	10:1

MAX FLOW (see table for actual availability)	
H	high flow 75 l/min
S	max flow 60 l/min **(std)**
R	max flow 30 l/min
F	max flow 15 l/min
U	max flow 4 l/min

SEAL	
N	NBR (**standard**)
V	Viton

AVAILABILITY TABLE

	scheme	adjustment	pressure range [bar]	max flow [l/min] (code)			
				4 (**U**)	15 (**F**)	30 (**R**)	60 (**S**)
flow ratio 3:1							
	normal						
		fixed	100…280		■		
			105…210				■
			200..390		■		
			200…350				■
			30…105		■		
			340…420				■
	vented						
		fixed	105…210	■	■	■	
			170…330	■	■	■	
			330…390	■	■	■	
			40…105	■	■	■	
		variable	105…210	■	■	■	
			170…330	■	■	■	
			330…390	■	■	■	
			40…105	■	■	■	
flow ratio 4:1							
	normal						
		variable	100…280	■			
			200..390	■			
			30…105	■			
flow ratio 8:1							
	normal						
		variable	140...350				■
			70...210				■
	vented						
		fixed	140...350				■
			70...210				■

CODE EXAMPLES:

KCB1S-V040N3-S-N-1
KCB1S-F210N8-S-N-1

HYDRECO

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QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001:2015

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