HYDAC INTERNATIONAL

Progressive compact control unit KS for mechanical presses

With type-tested PSV according to DIN EN ISO 16092-2

KINESYS

Description

The HYDAC Compact Control Unit KS is designed to control hydraulically operated clutch / brake combinations (CBCs) for mechanical presses. The unit contains a type-approved press safety valve (PSV) that prevents unintended ram motion and ensures safe machine shutdown according to DIN EN ISO 16092-2. Further information about the HYDAC PSV can be found in brochure or document no. 5139.

The HYDAC Compact Control Unit KS is available in the nominal sizes 10 and 16 and offers options for soft coupling and soft braking, either separately or in combination.

Available variants

- Nominal sizes 10 and 16
- Soft coupling, soft braking, or combination
- Various voltage variants
- With or without hydraulic accumulator
- Pressure monitoring at the pump or accumulator and at the CBC connection port

Your advantages

- Minimal space requirements, maintenance effort and piping, with considerable cost savings compared to individual piping
- Significantly reduced assembly time
- Reduction in switching noise thanks to damping systems
- No complex electrical control required for soft coupling process due to use of purely hydraulic pressure-dependent 2/2 directional valves
- The hydraulic control unit complies with the requirements set out in DIN EN ISO 16092-2
- Type-approved PSV using standard industrial valves
- Fast engagement / disengagement times

Technical data

General information		
Weight and dimensions	See pages 15 and 16	
Connections (hydraulic)	See pages 15 and 16	
Ambient temperature range	Min. -20 °C to max. +60 °C	
Installation position	No orientation restrictions, with accumulator upright	
Hydraulic parameters	**NS10**	**NS16**
Maximum operating pressure	210 bar	
Maximum flow rate	120 l/min	200 l/min
Maximum pump flow rate P-channel during accumulator operation	20 l/min	110 l/min
Maximum pump pressure P-channel during accumulator operation	110 bar	
Operating fluid	Hydraulic oil as per DIN 51524 Part 1 and 2	
Temperature range of operating fluid	Min. -20 °C to max. +80 °C	
Operating fluid viscosity range	Min. 10 cSt to max. 350 cSt	
Operating fluid viscosity range for accumulator operation	Up to max. 350 cSt	Up to max. 230 cSt
Cleanliness class according to ISO 4406	Class 20/18/15 or better Class 18/16/13 or better (when using proportional valves)	
Electrical parameters		
Voltage type	DC or AC voltage	
Nominal voltage	24 Volt DC ±10 %, 110 Volt AC ±10%	
Protection class	IP 65 according to DIN EN 60529 (when installed correctly)	
Electrical connection Solenoid valves	Plug according to EN 175301-803 (DIN 43650) (not included in the scope of delivery)	
Electrical connection Switch position monitoring and sensors	M12x1 plug, 4-pin, A-coded M12x1 plug, 5-pin, A-coded (not included in the scope of delivery)	

Model code

KS – 10 – X – 24 – 6U – p0 – KM – BM

Model
Compact control unit

Nominal size
10 = Nominal size 10
16 = Nominal size 16

Series
X = Determined by the manufacturer

Nominal voltage of the solenoid coils
24 = 24 V DC
110 = 110 V AC

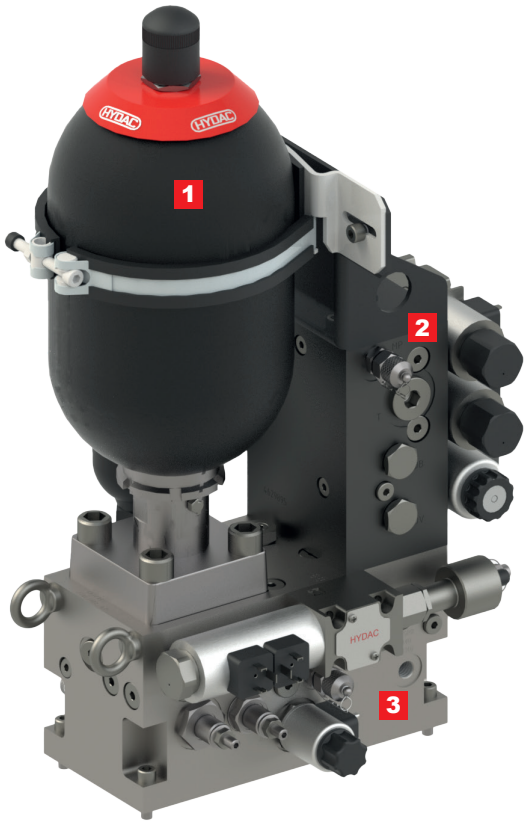
Accumulator selection
0 = Without accumulator
2 = Diaphragm accumulator V = 2.8 l
4 = Bladder accumulator V = 4 l
6 = Bladder accumulator V = 6 l
10 = Bladder accumulator V = 10 l

Accumulator certificate code
Europe (PED) = U
Without accumulator = 0
Others on request = +

Prefill pressure
Standard = 30 bar, (435 psi)
Individual = xx bar

Soft coupling
KM = Hydraulically operated coupling
KE = with additional electric bypass valve (set-up) for KM variant
00 = Without soft coupling

Soft braking
BM = With manual pressure limitation
BE = With proportional pressure limitation (without plug-in amplifier)
BA = With proportional pressure limitation and plug-in amplifier (4 – 20 mA)
BB = With proportional pressure limitation and plug-in amplifier (0 – 10 V)
00 = Without soft braking



Functional range

1 **Accumulator (with mounting bracket for bladder design)**

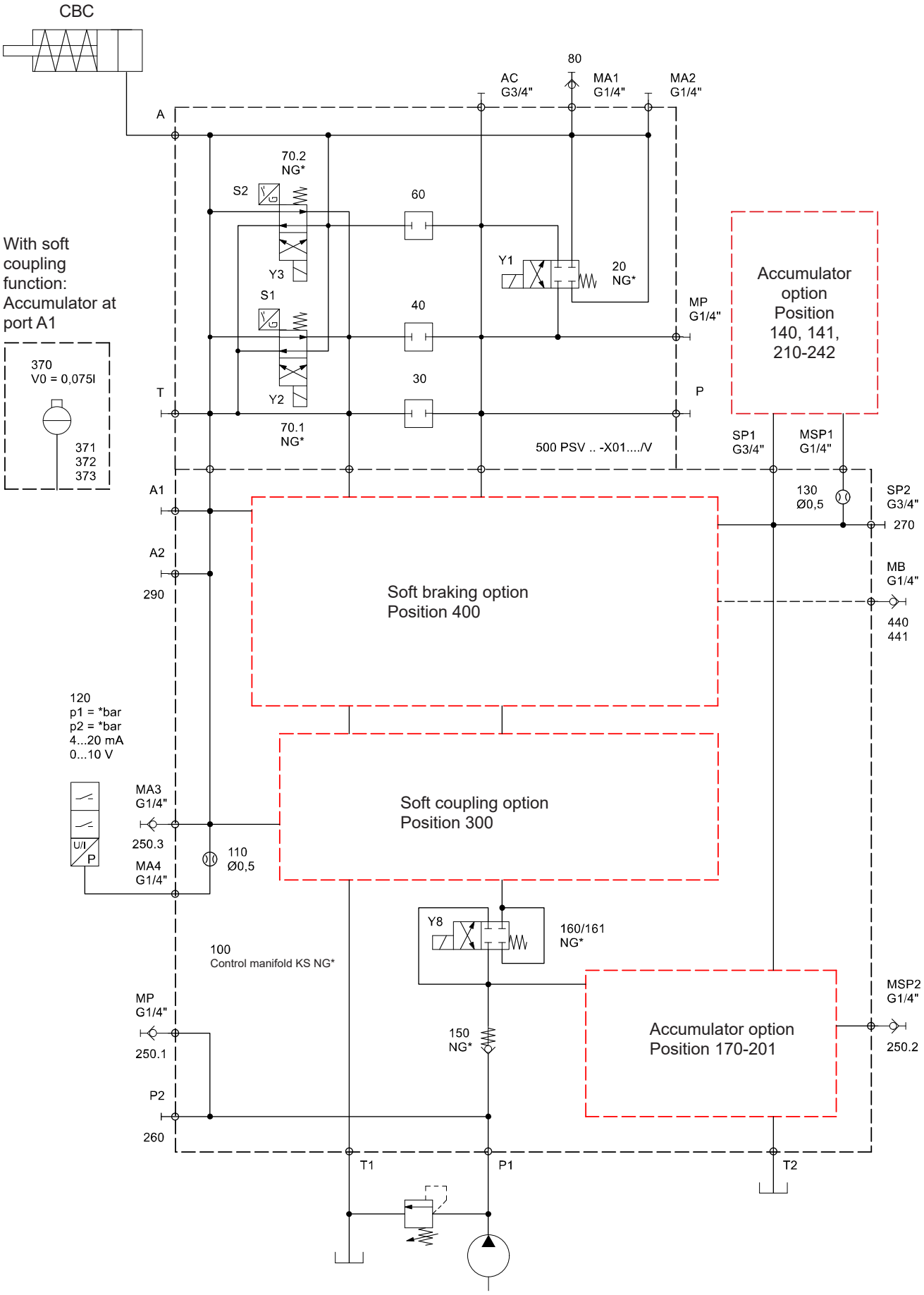
2 **HYDAC PSV**

3 **Monoblock with:**

- Soft coupling option
- Soft braking option
- Combination of soft coupling and braking
- Accumulator safety valves
- Pressure monitoring in A

Schematic design

Generic circuit diagram for NG10/NG16



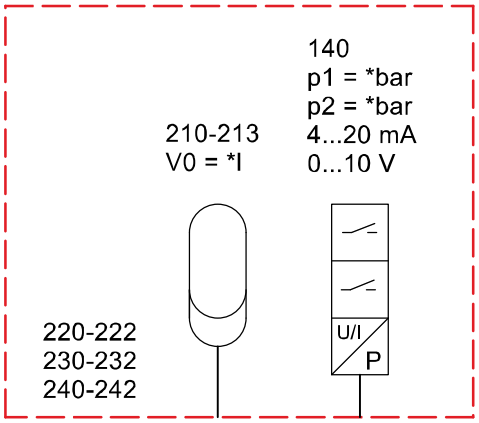
Important notices

- Circuit contains pressure accumulator. Please observe accumulator safety information!

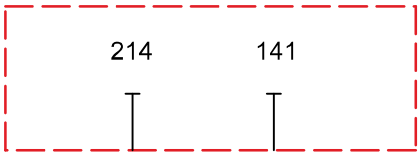
Description of options

Accumulator configuration

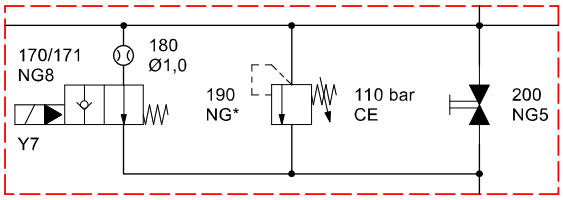
The compact control unit can be equipped with a hydraulic accumulator and the associated accumulator safety valves.
The pressure switch (position 140) is then also included in the delivery.
If no accumulator is needed, the option '0' should be selected.



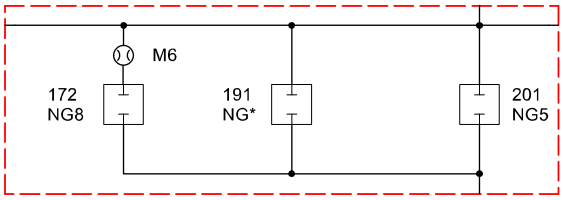
Options 2, 4, 6 and 10: with accumulator



Option 0: without accumulator



Options 2, 4, 6 and 10: with accumulator safety valves



Option 0: without accumulator safety valves

Important notices

- Please refer to the technical data on page 1 for the maximum permitted pump flow rates and pressures!
- The accumulator safety valve (position 190) is preset and sealed. It must not be tampered with!
- The minimum and maximum accumulator pressure (p1/p2) refers to the minimum and maximum torque, respectively, and is specified by the clutch manufacturer.

Soft coupling option, position 300

Soft coupling functionality

When the press is started, the press safety valve is switched, and the system pressure p_{nom} releases the brake and moves the piston to the coupled position. The available accumulator volume enables the entire switching process to be completed very quickly. When the piston makes contact, the closing pressure p_{CP} of the clutch is reached, and the press ram is accelerated with the applied pressure.

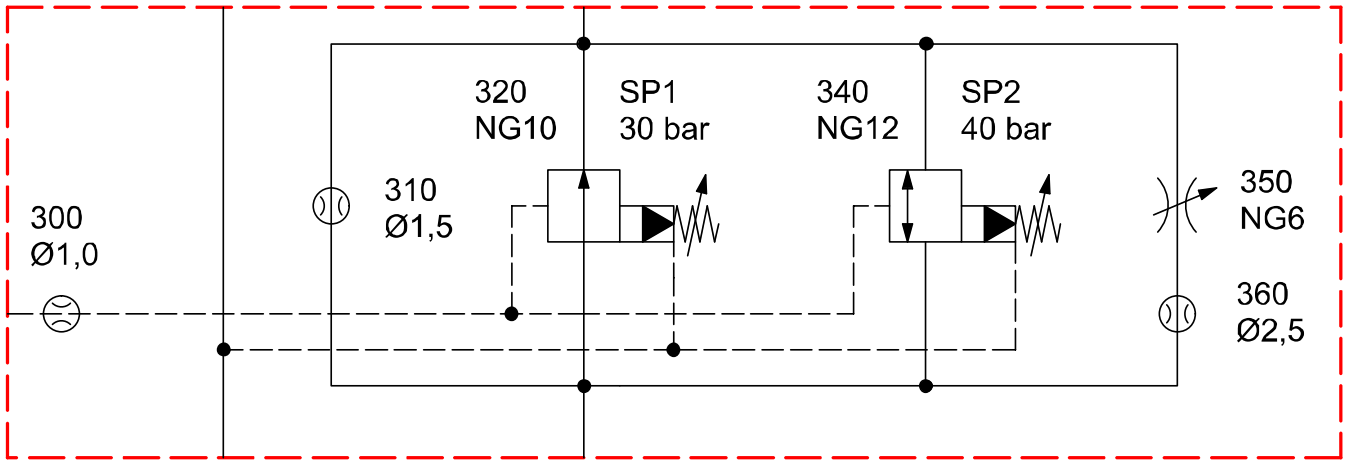
With hard coupling, ram acceleration occurs with an acceleration pressure p_{SP1} of approx. 40 bar.
($p_{SP1} = p_{nom} - p_{CP}$ e.g. $p_{SP1} = 60 - 20 = 40$ bar. (acceleration pressure $p_{SP1} = 40$ bar); see Fig. 1.

Since pressure can be compared to torque in a friction clutch, soft coupling achieves gentler operation by accelerating the ram with a lower Δp. For example, $p_{SP1} = 30 - 20 = 10$ bar (acceleration pressure = 10 bar).
When the pressure in the CBC reaches the level set at the pressure cut-off valve (position 320) (lower pressure setting p_{SP1}, factory-set to 30 bar), the valve closes and further pressure build-up in the CBC occurs through the orifice (position 310, standard configuration Ø 1.5 mm).
The orifice and thus the clutch closing behaviour can be modified; see Fig. 2. When the pressure set at the pressure cut-in valve (position 340) is reached (upper pressure setting p_{SP2}, factory set to 40 bar, adjustable), the valve opens and provides a larger cross-section towards the clutch. This ensures that the clutch remains engaged even if piston leakage occurs. To optimise the soft coupling process, the diaphragm accumulator (position 370) is used; see the generic schematic diagram on page 3.

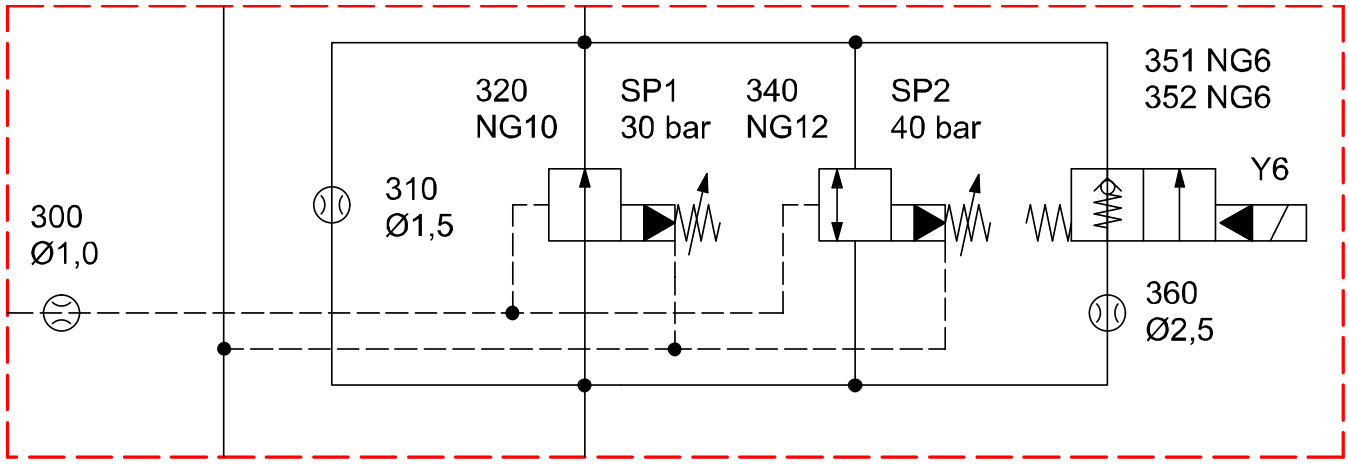
Available options

If the compact control unit is to be equipped with soft coupling, two options are available. Variant 'KM' enables manual activation / deactivation of the function via positions 350 and 360, while option 'KE' features a solenoid valve in position 351 (24 V DC) or 352 (110 V AC) for bypassing the function, which is useful when setting up the press. If soft coupling is not required, option '00' should be selected.

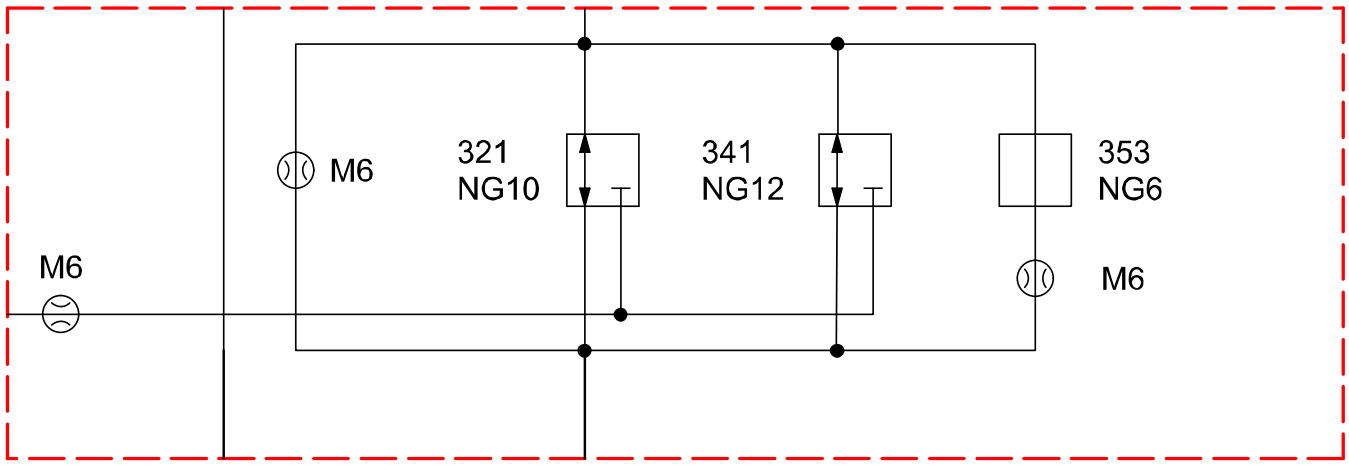
Soft coupling option size 10



Soft coupling size 10 with manual deactivation, option 'KM'

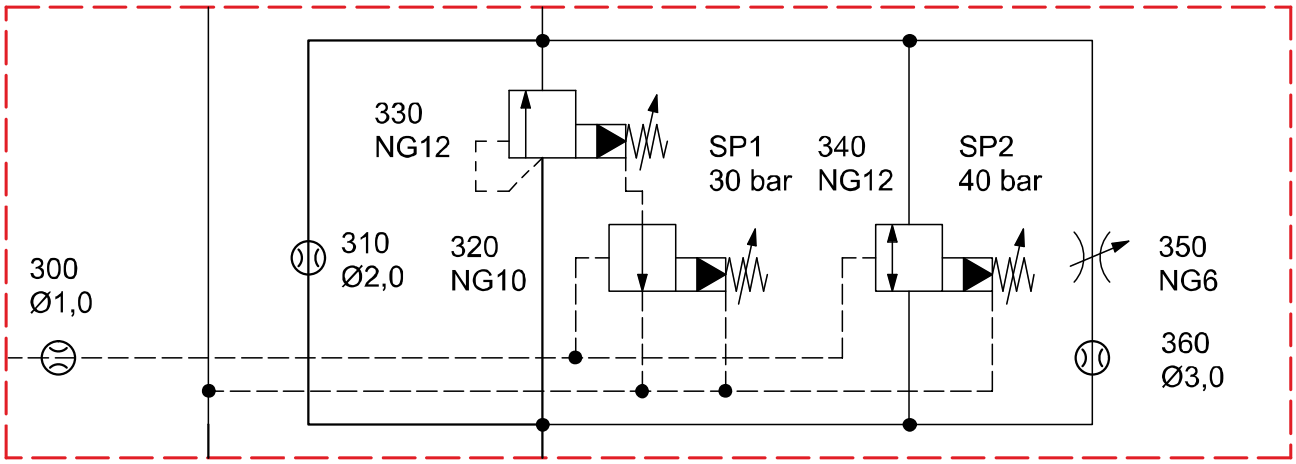


Soft coupling size 10 with electrical deactivation, option 'KE'

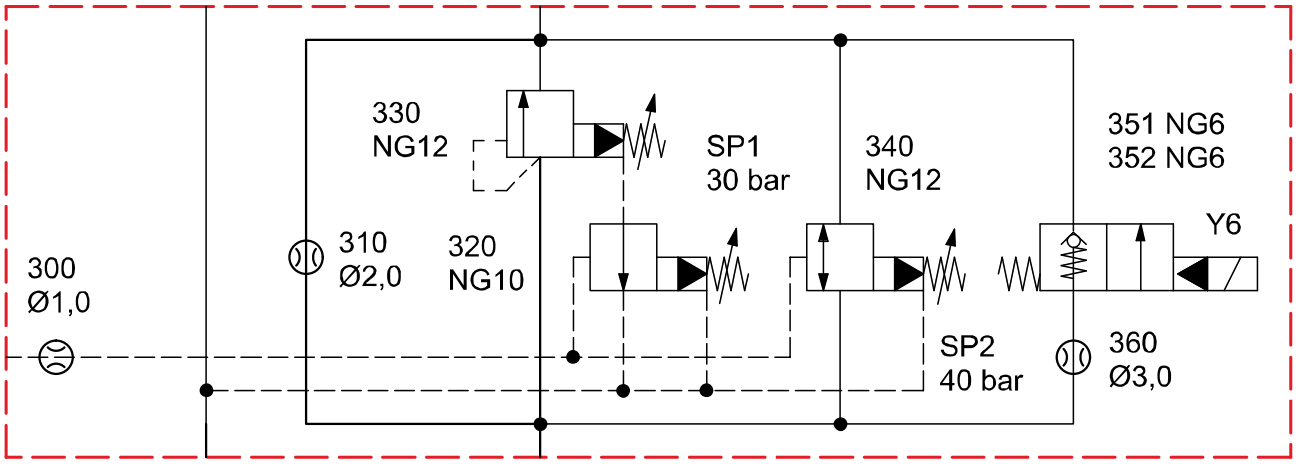


Without soft coupling size 10, option '00'

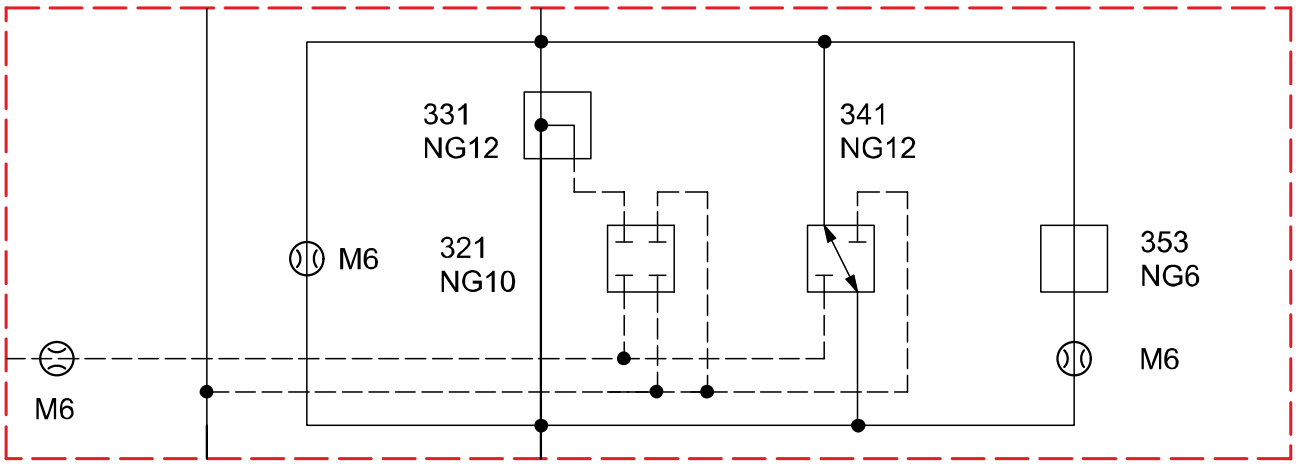
Soft coupling option size 16



Soft coupling size 16 with manual deactivation, option 'KM'



Soft coupling size 16 with electrical deactivation, option 'KE'



Without soft coupling size 16, option '00'

Notice

Valves in positions 320 (SP1) and 330 (SP2) are preset as shown in the schematic diagram.
However, the switching points can be adjusted.

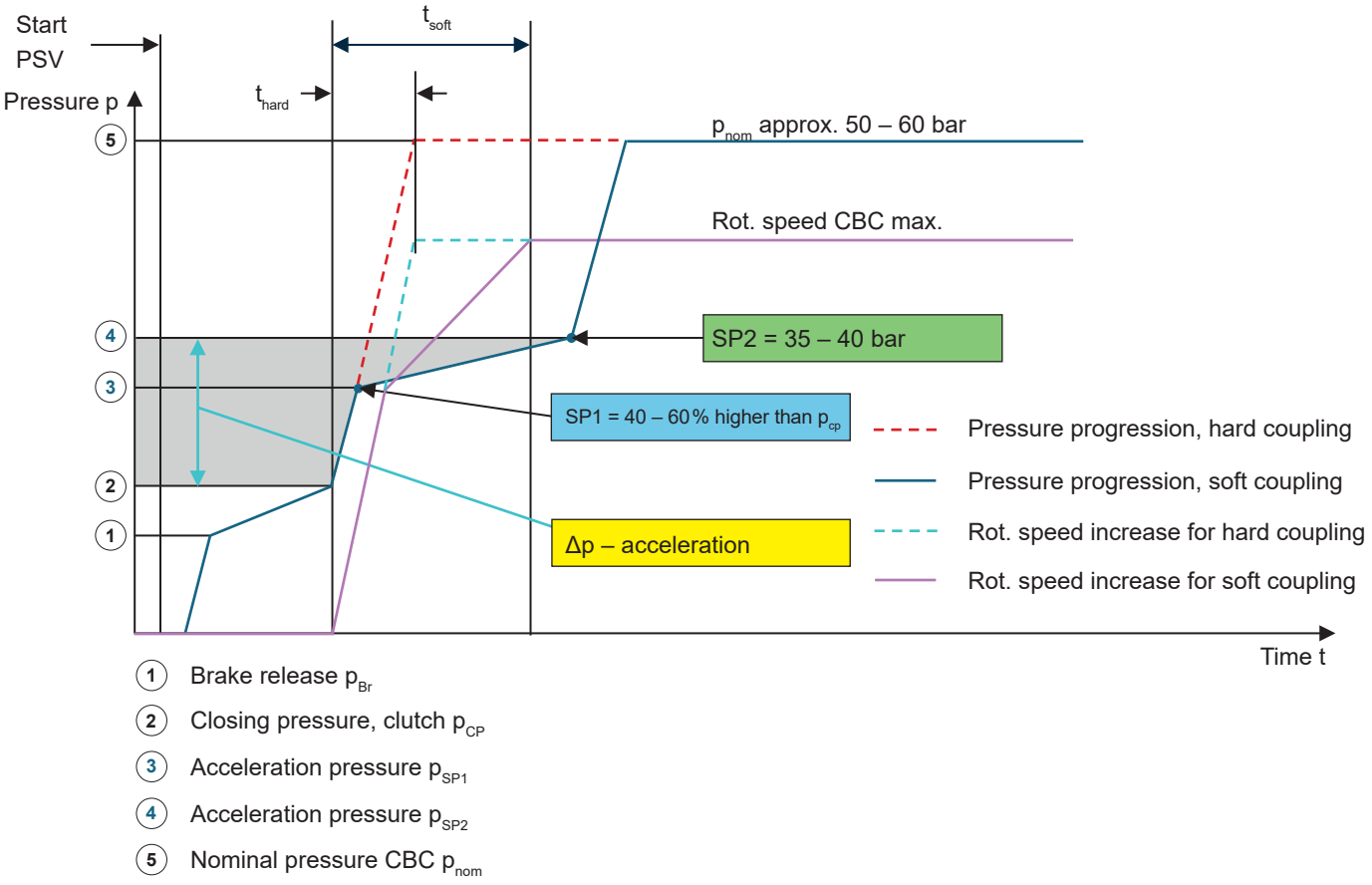


Figure 1: Schematic progression of pressure and speed during soft coupling of a CBC

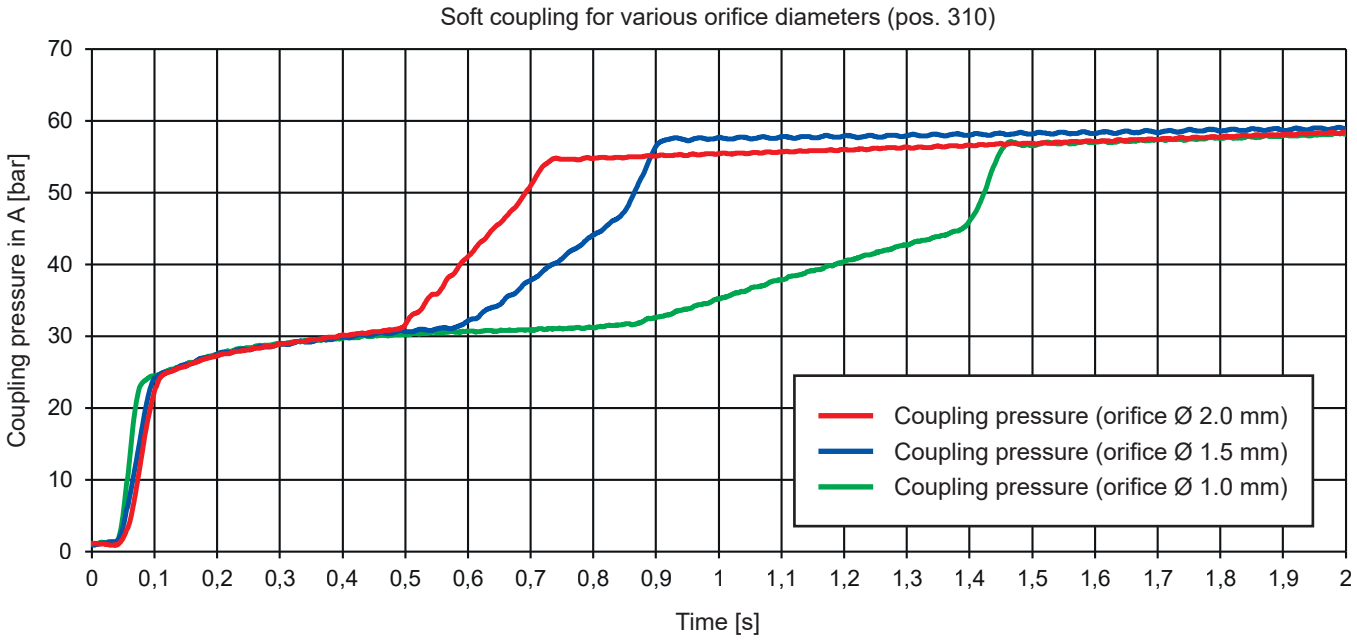


Figure 2: Measured progression of pressure for a CBC with 164 cm³ switching volume, 5 mm stroke, compact control unit size 10 with 4l accumulator, measured with HLP 46 with 40 °C oil temperature

Soft braking option, position 400

Soft braking functionality

Without the soft braking function, the clutch is opened and the brake engages abruptly shortly before reaching top dead centre (TDC) (PSV in neutral position); see Fig. 3. The soft braking function prevents this abrupt brake engagement. To achieve this, solenoid Y5a of the enabling valve in position 430 (24 V DC) or 431 (110 V AC) is energised shortly before TDC. The brake valve in position 400/401 opens and reduces the pressure to the set value before the PSV opens and completely relieves the pressure in the brake. For additional damping, a small volume from the accumulator is fed to the CBC via the orifice in position 420 (factory-set to Ø 1.5 mm) and the check valve in position 410.

The crankshaft angle for initiating the soft braking process must be determined during commissioning.
A good reference value is approx. 300°.

During continuous operation, solenoid Y5b is switched, keeping the brake valve in position 400/401 and release the pressure in positions 410 and 420.

In emergency stop situations, the valve in position 430 (24 V DC) or 431 (110 V AC) moves to its spring-centred middle position, opening the brake valve in position 400/401 and relieving the bypass. This ensures the hazardous movement is stopped as quickly as possible.

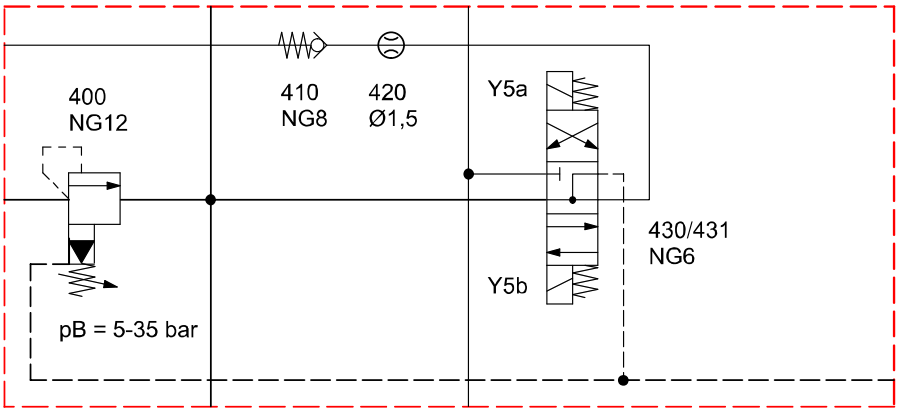
The brake pressure relief valve has an adjustment range of 5 – 35 or 5 – 60 bar (with electrical pressure adjustment).

Important notice:

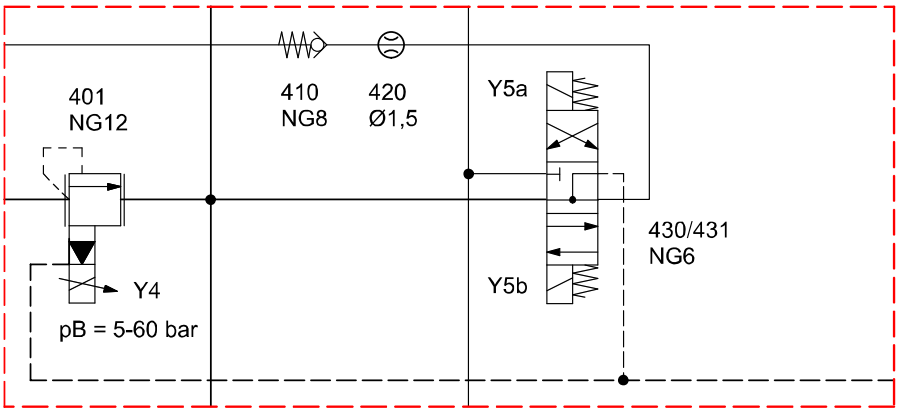
Soft braking is ONLY permissible for TDC shutdown!

Available options

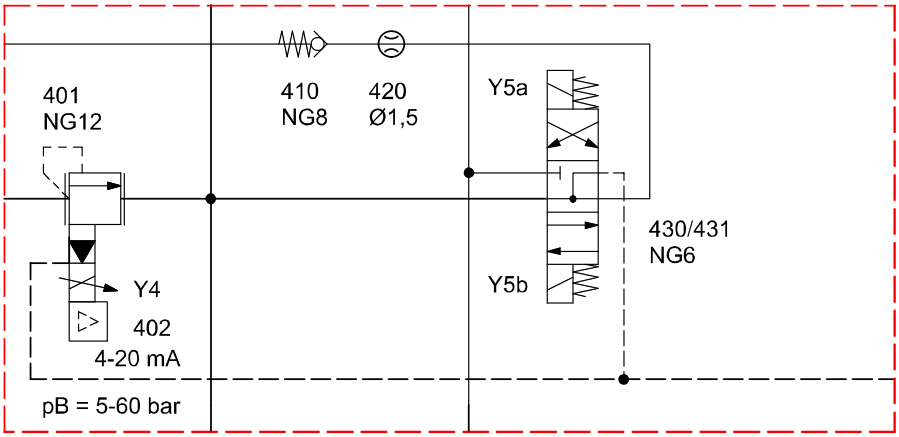
If the compact control unit is to be equipped with soft braking, four options are available. Variant 'BM' offers manually adjustable brake pressure (position 400). Option 'BE' allows proportional brake pressure adjustment through setpoint input from the PLC (position 401). Variants 'BA' and 'BB' include a corresponding plug-in amplifier in addition to the proportional valve. If soft braking is not required, option '00' should be selected.



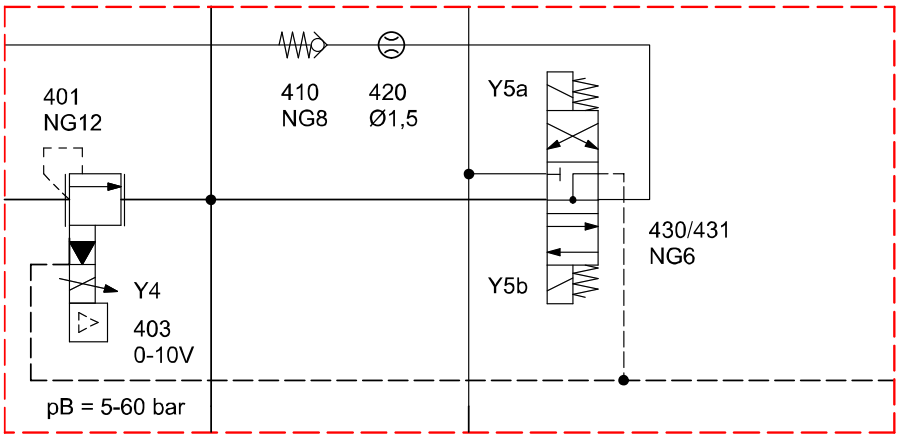
Soft braking with manual pressure adjustment, option 'BM'



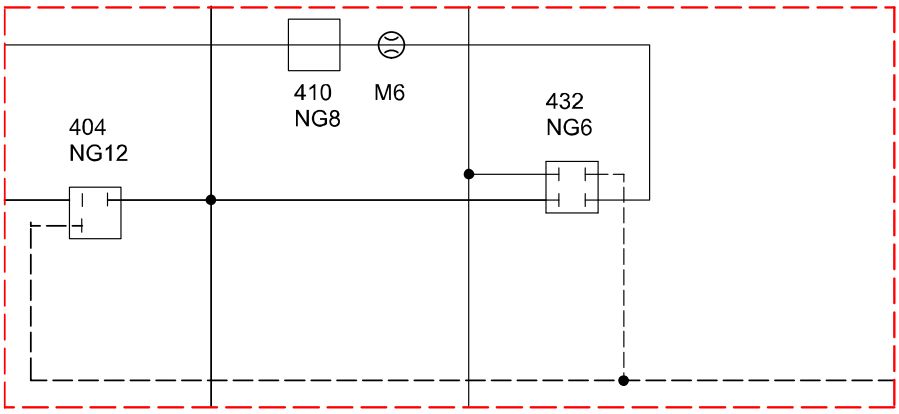
Soft braking with electrical pressure adjustment, option 'BE'



Soft braking with electrical pressure adjustment and 4–20 mA plug-in amplifier, option 'BA'



Soft braking with electrical pressure adjustment and 0–10 V plug-in amplifier, option 'BB'



Without soft braking, option '00'

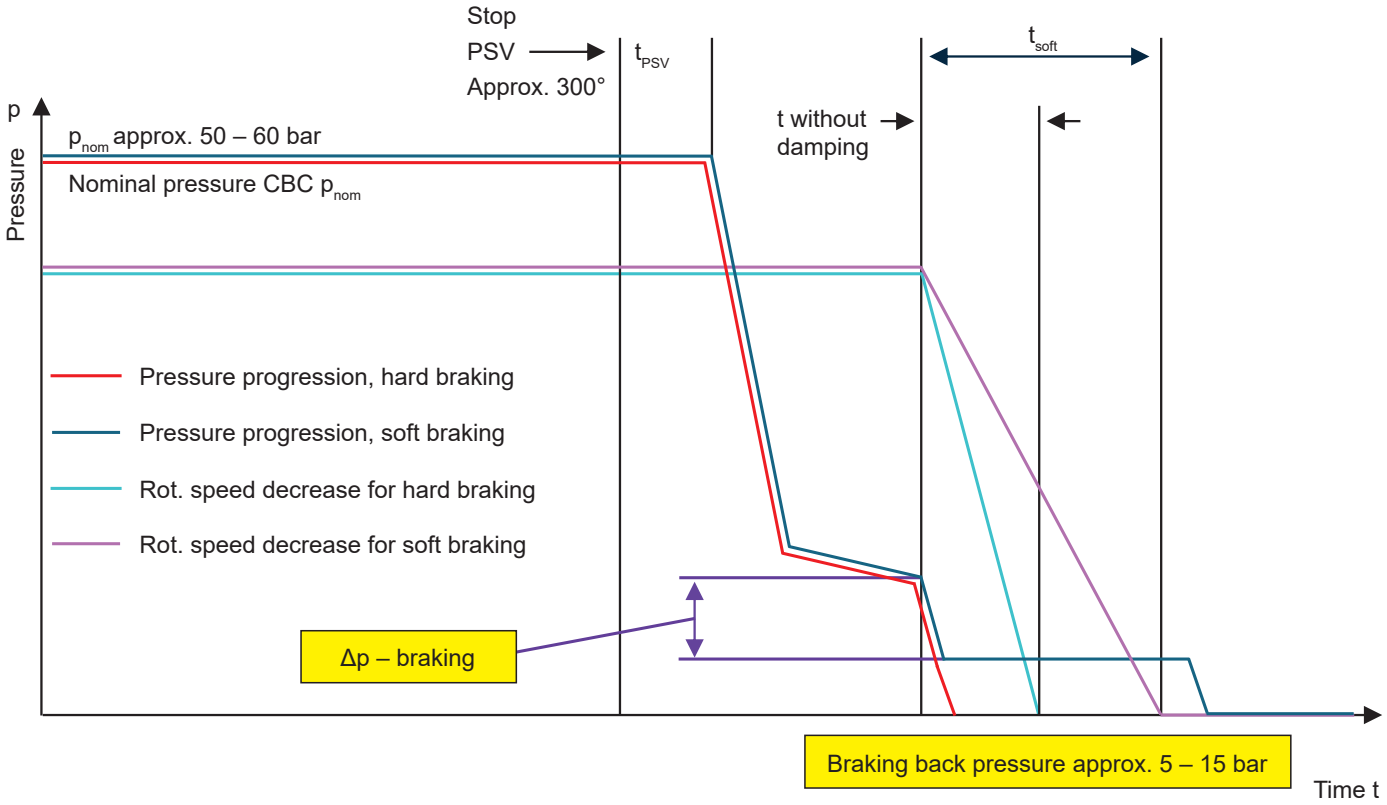
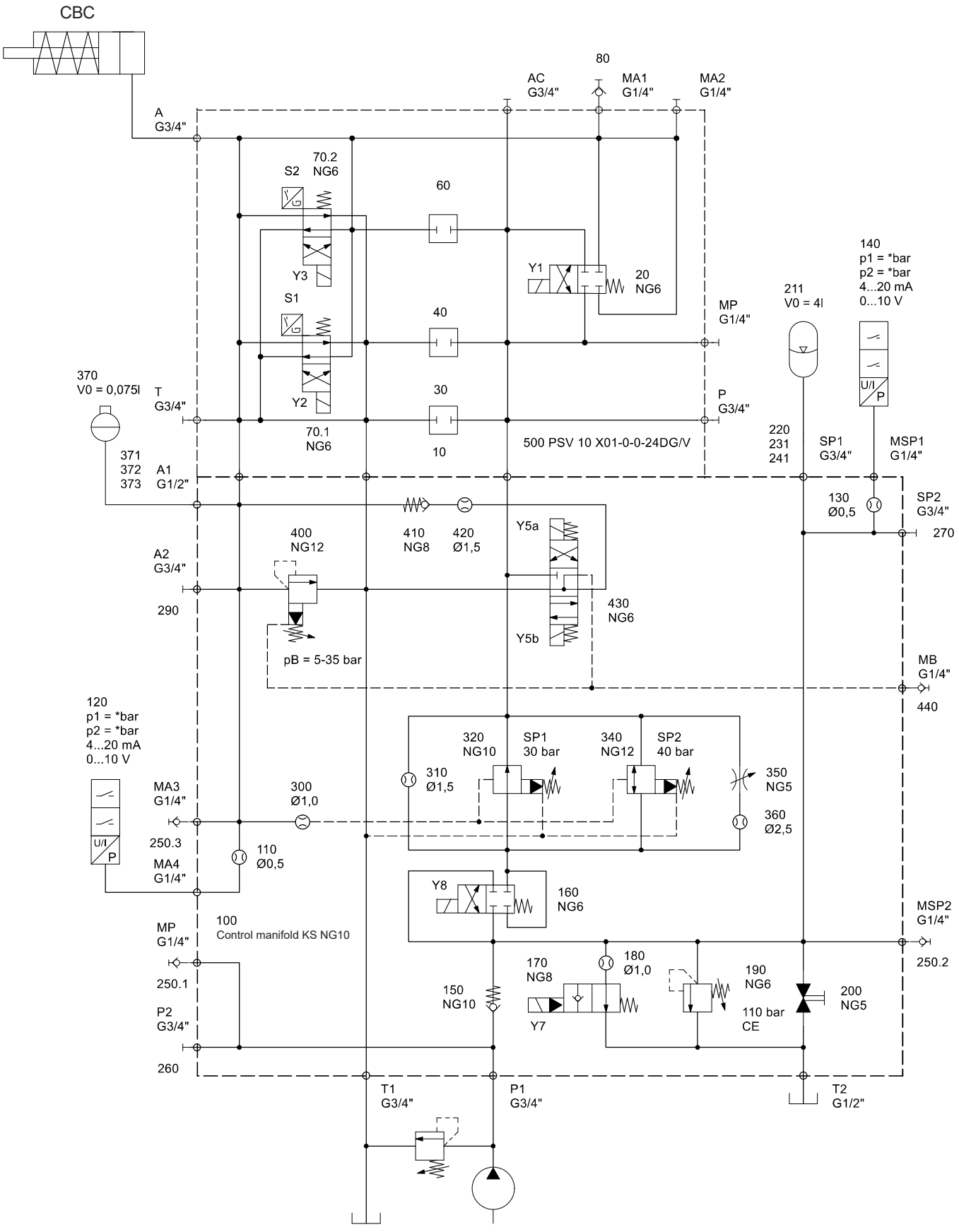


Figure 3: Schematic pressure progression during CBC soft braking

Specific examples

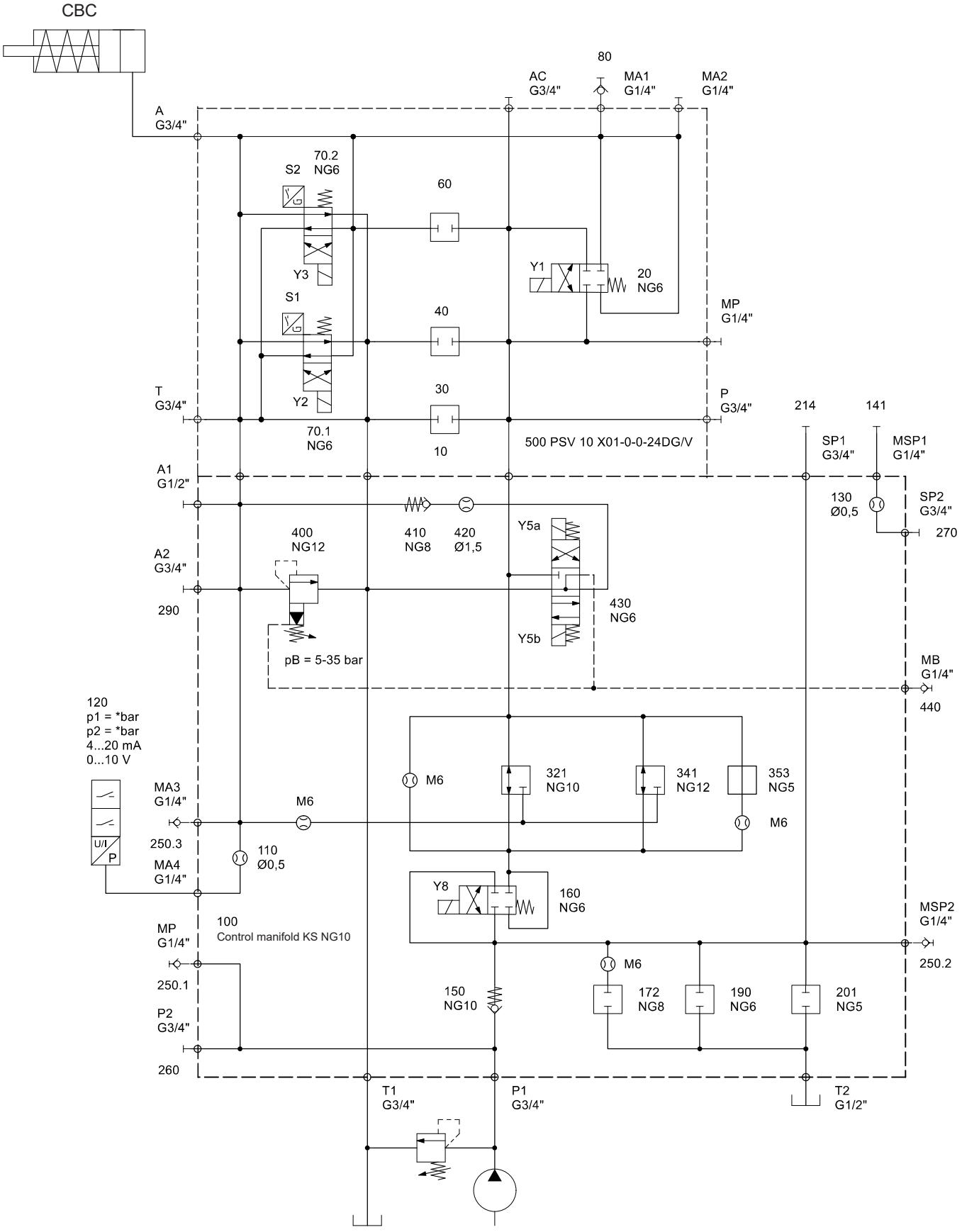
1. Compact control unit with soft coupling and soft braking



Example 1: KS 10 X-24-4U-KM-BM

The design example shows a compact control unit of nominal size 10 with the soft coupling and braking options.
Both functions can be manually activated / deactivated. The solenoid voltage is 24 V DC; a 4 l bladder accumulator is fitted.

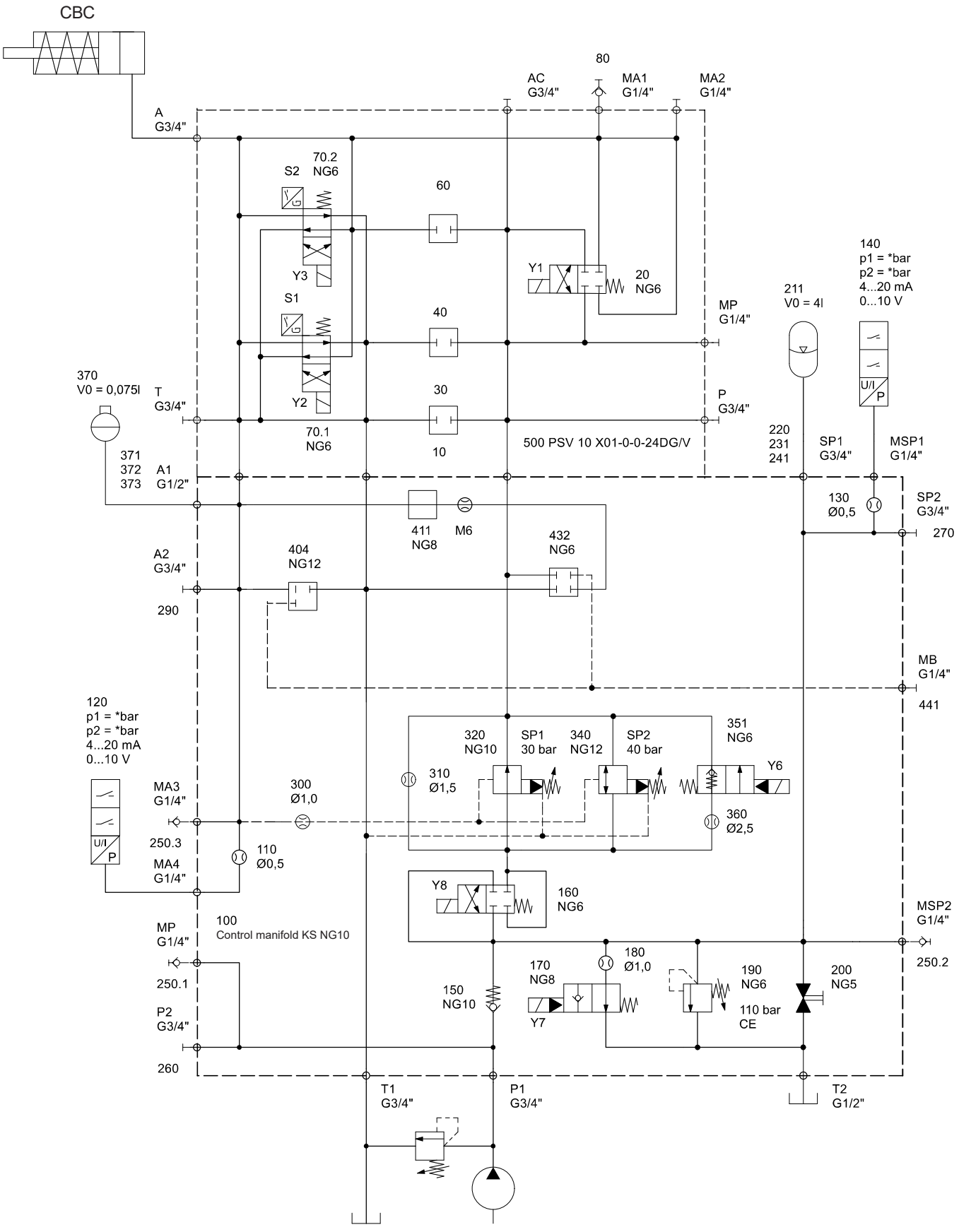
2. Compact control unit with soft braking



Example 2: KS 10 X-24-00-00-BM

The design example shows a compact control unit of nominal size 10 with the soft braking option.
The function is manually adjustable. The solenoid voltage is 24 V DC; no accumulator is fitted.

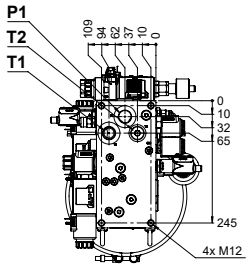
3. Compact control unit with soft coupling

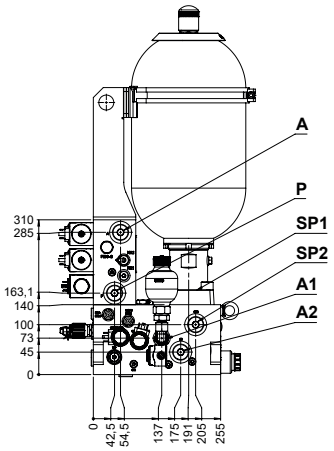


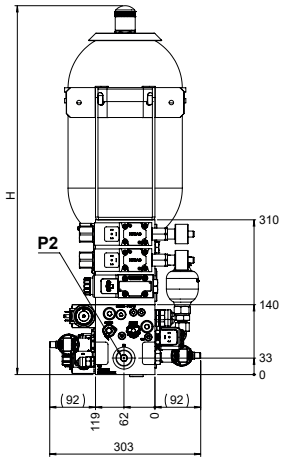
Example 3: KS 10 X-24-4U-KE-00

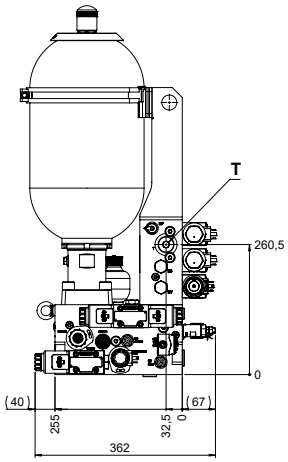
The design example shows a compact control unit of nominal size 10 with the soft coupling option.
The function can be electrically deactivated. The solenoid voltage is 24 V DC; a 4 l bladder accumulator is fitted.

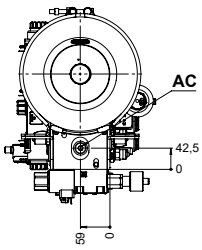
Dimensional drawing, masses and hydraulic connections, nominal size 10











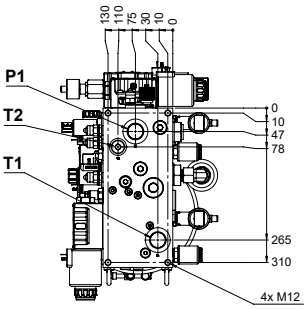
Hydraulic connections

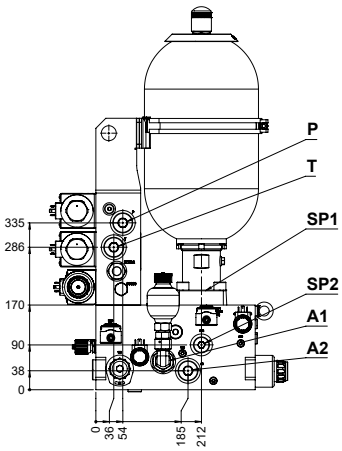
Port	Size
P, A, AC, SP T, T1	G¾"
T2	G½"
All 'M'	G¼"

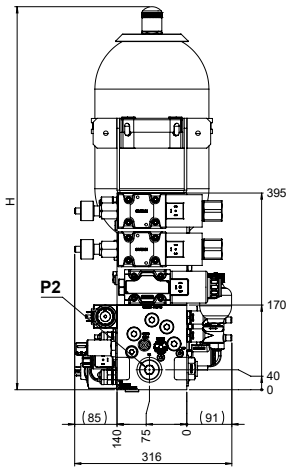
Technical data

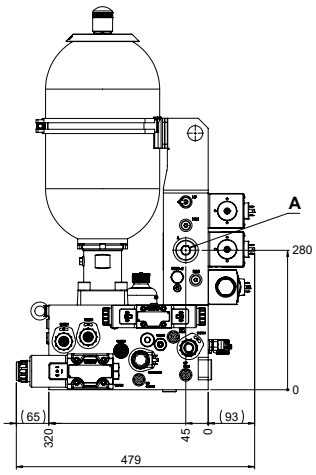
Model	Height H in mm
Without accumulator	346
2.8 l accumulator	444
4 l accumulator	575
6 l accumulator	689
10 l accumulator	739

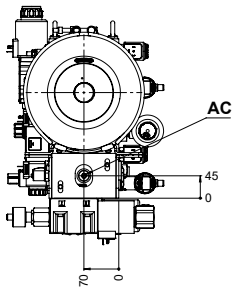
Dimensional drawing, masses and hydraulic connections, nominal size 16











Hydraulic connections

Port	Size
P, A, SP T, T1	G1"
AC	G¾"
T2	G½"
All 'M'	G¼"

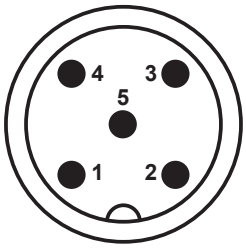
Technical data

Model	Height H in mm
Without accumulator	431
2.8 l accumulator	474
4 l accumulator	605
6 l accumulator	719
10 l accumulator	769

Sensors

Pressure switches EDS 3448-5

Pin assignment



M12x1, 5 pole

Pin	Outlet: 5
1	$+U_B$
2	Analogue
3	0 V
4	SP 1
5	SP 2

For technical data, refer to the data sheet EN 18.060...

Proportional brake valve, option "KE"

Further information about the brake valve can be found in the data sheet:

EN 5.911.15..., PDBM12121PE-01-C-N-060-24PG-8.8

Compatible amplifier electronics (see data sheet EN 24.000...):

Plug-in amplifiers:

EHCD-AP011XXXD with 0 – 10 V setpoint input, part no. 6112594

EHCD-AP012XXXD with 4 – 20 mA setpoint input, part no. 6108508

Power amplifiers with modular design (control cabinet installation):

EHCD-AM002XXXR, part no. 6108509

EHCD-AM005XXXU, part no. 6158999

Interface box:

The interface box for setting the parameters of the plug-in amplifier is NOT included in the scope of delivery!

EHCD-APIFB, part no. 6108514

Further information can be found in the data sheet EN 24.000...

The software 'EHCD Control Module Parameterisation Software' for setting the parameters of the plug-in amplifiers can be downloaded from the internet:

https://www.hydac.com/en/e-tools/drivers-software/

Orifices for no. 310/420

627029	Orifice-B-M 6 x 6 x 0.5 - C35
616030	Orifice-B-M 6 x 6 x 0.8 - C35
616032	Orifice-B-M 6 x 6 x 1.0 - C35
616032	Orifice-B-M 6 x 6 x 1.0 - C35
6006874	Orifice-B-M 6 x 6 x 1.5 - C35
616038	Orifice-B-M 6 x 6 x 2.0 - C35
629751	Orifice-B-M 6 x 6 x 2.5 - C35
612273	Orifice-B-M 6 x 6 x 3.0 - C35

Note

The information in this brochure relates to the operating conditions and applications described.

For applications and/or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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