

## Safety for Hydraulics

Proportional Valves, Sectional Design  
Series SC 22



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## 1 Description

Our sectional proportional valves regulate the flow rate to the actuator by means of an internal closed-loop control system. Load-independent flow control is guaranteed by individual pressure compensators upstream of each proportional directional valve (load-sensing principle). The highly adaptable modular system consists of an inlet module, actuator modules (with up to eight sections), and an end module and is specially designed for use in mobile hydraulics. The user can be assured that the right system is always available for every application.

This is accomplished by:

- Various inlet modules
- Actuator modules with individual compensator and optional, individually adjustable, primary and secondary pressure-relief valves
- Various types of operators

Use Section 6, "Ordering code", to establish the complete valve code.

### 1.1 Application examples

- Mobile Crane
- Ground Drilling
- Reach Stacker
- Cargo Handling Crane
- Ship Crane
- Application in explosion protection areas e.g. ATEX, IECEx, MSHA (please consult Bucher Hydraulics)

## 2 Technical data

General characteristics	Unit	Description, Value
Design		proportional valves, sectional design, spool type
Types of operators		<ul style="list-style-type: none"> <li>• electro-hydraulic proportional</li> <li>• hydraulic</li> <li>• manual (oil-tight enclosure)</li> <li>• electro-hydraulic proportional - manual, combined</li> <li>• electro-hydraulic proportional - hydraulic combined</li> <li>• for other types, please consult Bucher</li> </ul>
Size		port sizes to DIN 3852
Mounting attitude		unrestricted, but ensure good air-bleeding
Ambient temperature range	°C	-30 ... +60

Hydraulic characteristics	Unit	Description, value
Hydraulic fluid		HL and HLP mineral oil to DIN 51 524; for other fluids, please consult BUCHER
Hydraulic fluid temperature range	°C	-20 ... +80, recommended +20 ... +60
Viscosity range	mm <sup>2</sup> /s (cSt)	10 ... 500, recommended 15 ... 250
Minimum fluid cleanliness Cleanliness class to ISO 4406 : 1999		class 20/18/15
Maximum pump flow rate	l/min	500
Maximum actuator flow rate	l/min	340 (400 l/min – consult Bucher)
Maximum pump pressure	bar	370
Maximum load pressure	bar	420
Required control $\Delta p$ on the control block		see performance graphs, 3.2 flow control characteristics

Hydraulic characteristics	Unit	Description, value
Maximum tank pressure	bar	50
Maximum tank pressure with elec. pilot stage	bar	5

Hydraulic operation	Unit	Description, value
Pilot-pressure range	bar	6 ... 20
Pressure rating of pilot circuit	bar	max. 50

Size	Unit	Description, value
Actuator		A / B G 1¼"
Pump		P G 1¼"
Tank		T G 1½"
Load sensing		XL G ¼"
Pump for pilot stage		X G ¼"
Tank for pilot stage		Y G 3/8"
Test point for pump pressure		MP G ¼"

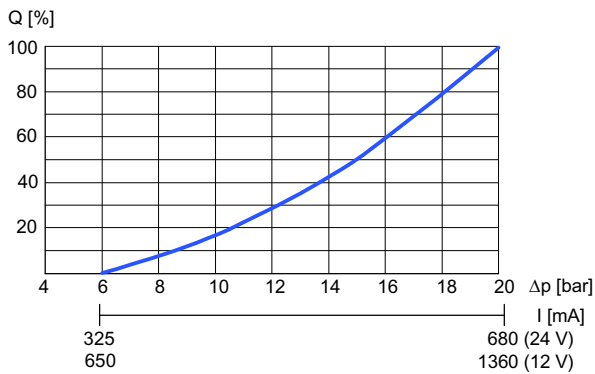
Electrical characteristics	Unit	Description, value
Control current at opening point 24 V 12 V	mA	325 650
Control current at max. stroke 24 V 12 V	mA	680 1360
Hysteresis with 100 Hz PWM signal (from control current at max. stroke)		± 3 %
Protection class to EN 60 529		IP 65
Insulation class to VDE 0580	H	H
Supply voltage	V	24 / 12
Coil resistance at 20 °C 24 V 12 V	Ω	21.2 ± 5 % 5.3 ± 5 %
Coil resistance at 60 °C 24 V 12 V	Ω	24.5 ± 5 % 6.1 ± 5 %
Power consumption at max. spool stroke (coil resistance at 60 °C)	VA	10.4
Relative duty cycle (ED) - limiting current: 24 V 12 V	mA	750 1500

## 3 Performance graphs

### 3.1 Control characteristics

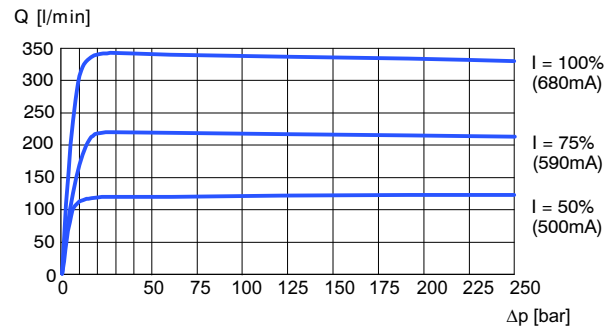
Control mode: electrohydraulically - proportional

$$Q = f(\Delta p_{st})$$



### 3.2 Flow-control characteristics

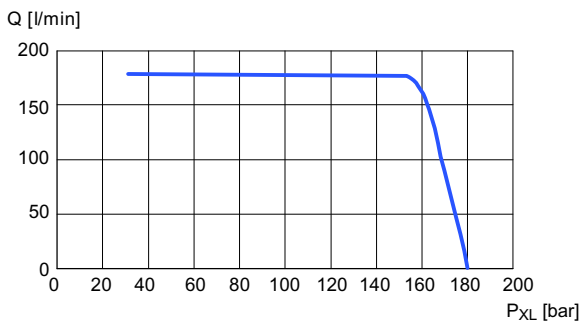
$$\Delta p = p_{Pump} - p_{Last} \text{ [ bar ]}$$



### 3.3 Primary-pressure cut-off

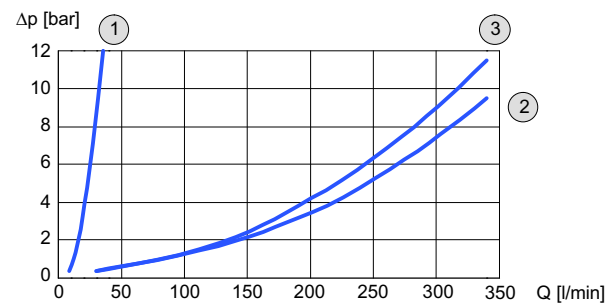
Q = Actuator flow rate at A or B

$P_{XL}$  = Load pressure characteristic



### 3.4 Pressure differential at directional valve spool – Return

Pressure differential - Flow rate characteristic

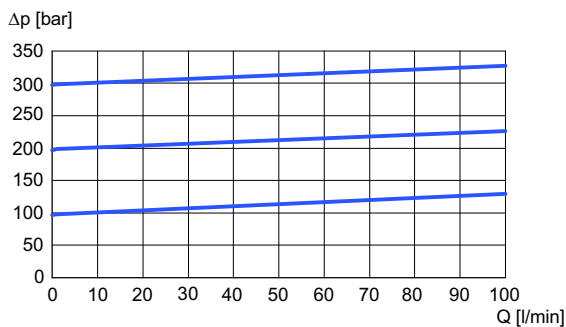


- |   |                                   |
|---|-----------------------------------|
| 1 | Spool type C in neutral position  |
| 2 | Spool type C at 100% energisation |
| 3 | Spool type A at 100% energisation |

### 3.5 Secondary pressure relief (optional)

Secondary pressure - flow rate characteristic

$$P_{A/B} - P_T = f(Q_{A/B} \rightarrow T)$$

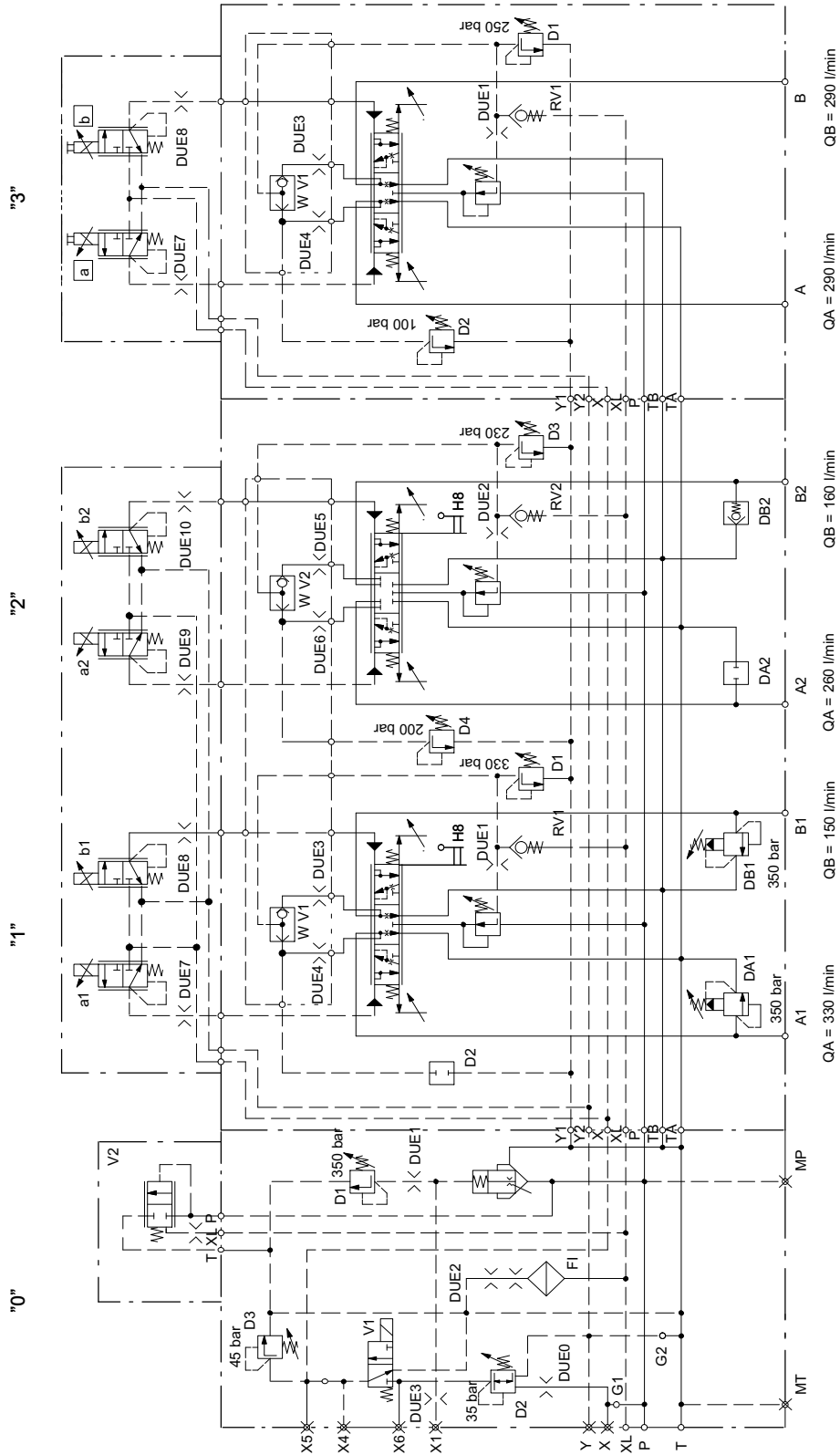


#### IMPORTANT!

The cross-sectional geometry of the spool and the pressure-differential setting are factory-set so that the valve's working range lies within the characteristic diagram.

## 4 Circuit diagram

### 4.1 Proportional valve with one inlet module and two actuator modules with three sections

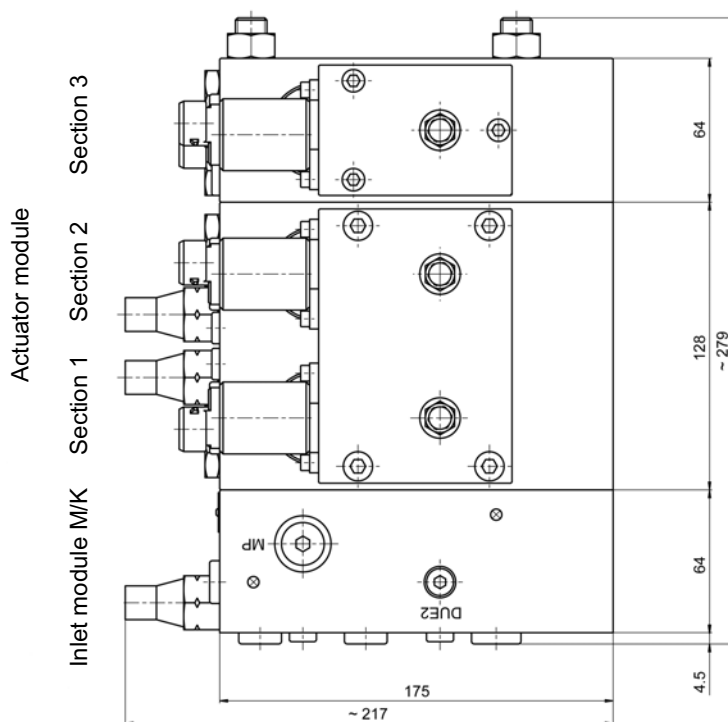
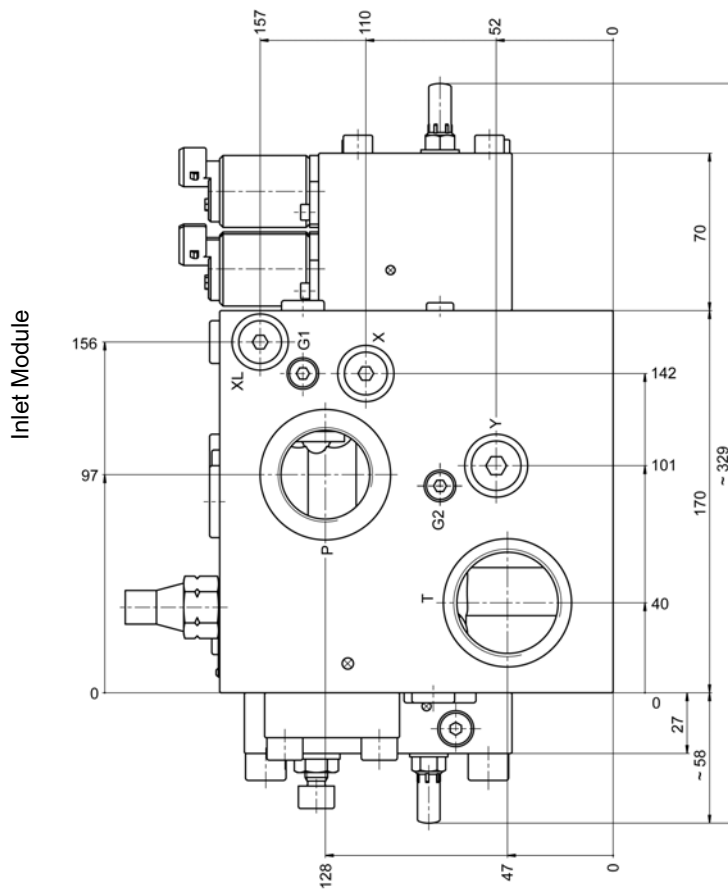


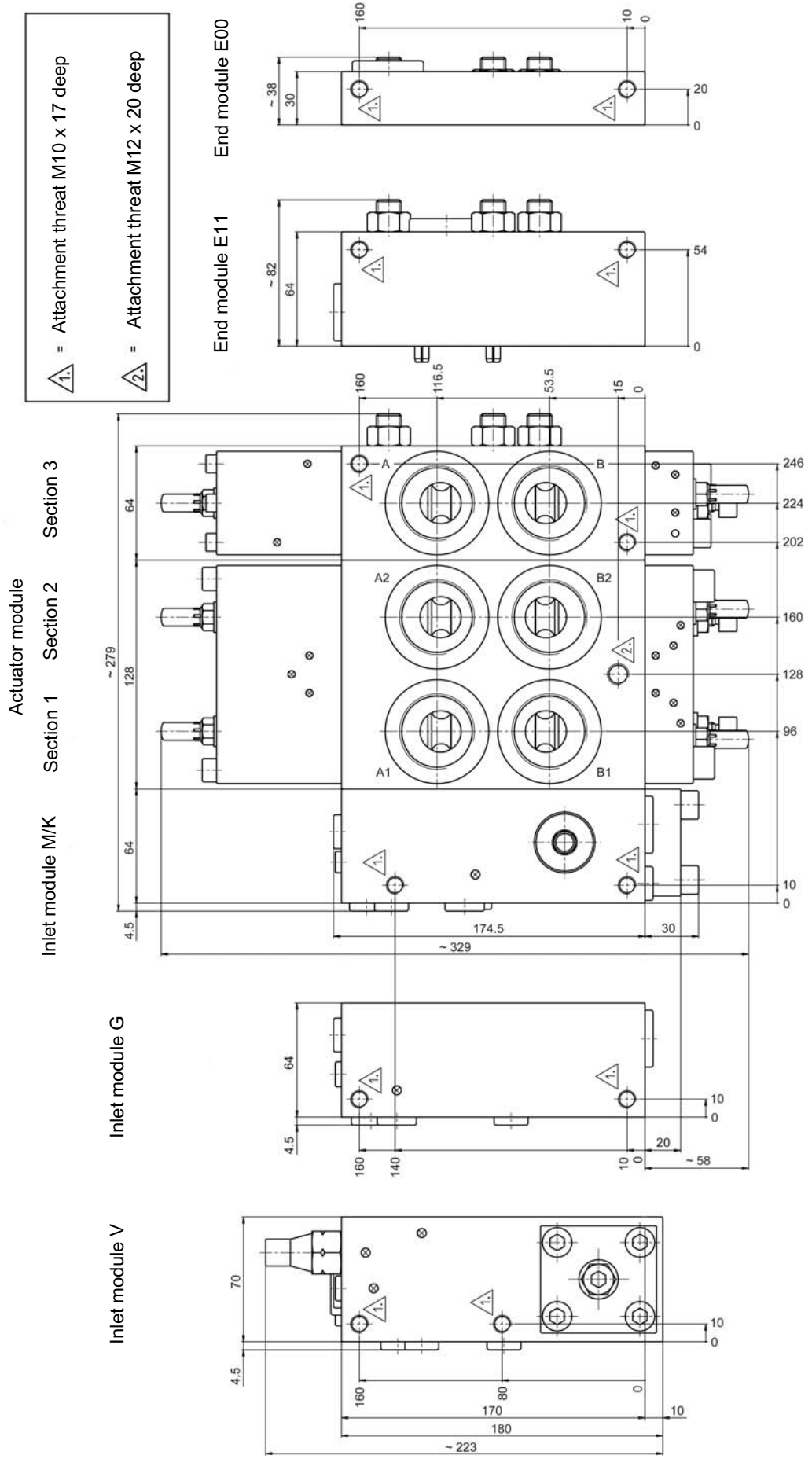
#### Ordering Example:

- "0" = SC22 - K01 - 111 - 350 - 35 - 45 - 0 - A
- "1" = SC22 - 1 - 1Y10 - 000 / 330 - C330 / 150 - K20 - L01 - D350 / D350 - A
- "2" = SC22 - 2 - 2Y10 - 200 / 230 - A260 / 160 - K20 - L01 - S000 / N000 - A
- "3" = SC22 - 3 - 0D00 - 100 / 250 - C290 / 290 - E20 - X11 - S000 / S000 - A

## 5 Dimensions

### 5.1 Dimensions, complete valve

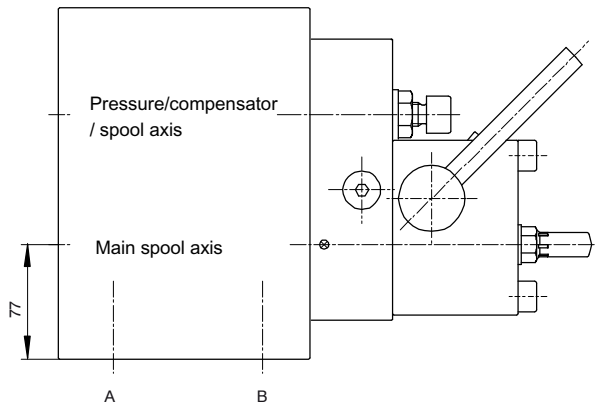




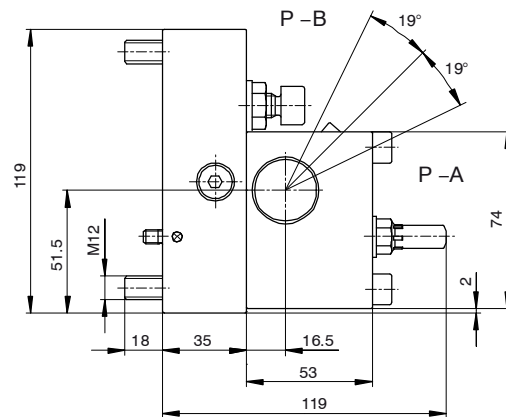


## 5.2 Dimensions, manual operator

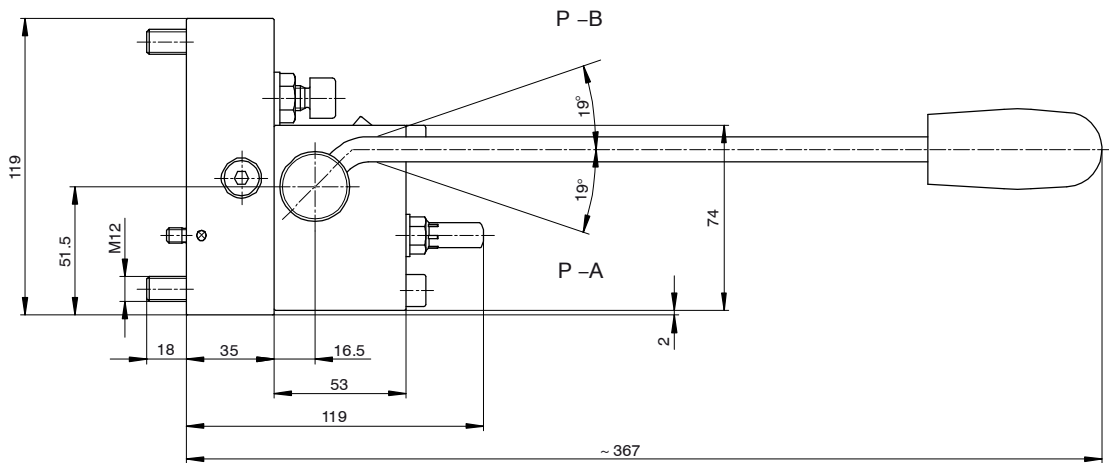
### 5.2.1 Arrangement on the valve body



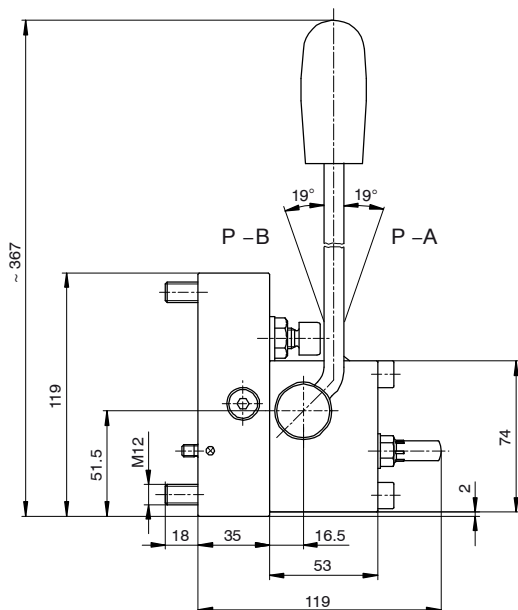
### 5.2.2 Without hand lever "Z"



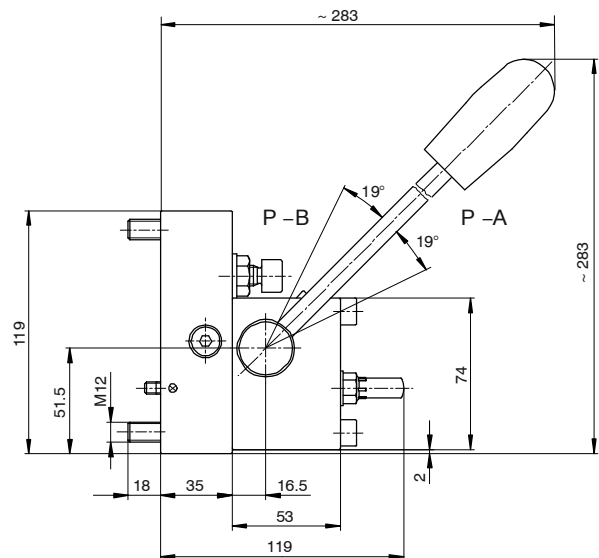
### 5.2.3 Hand lever position "A"



### 5.2.4 Hand lever position "F"



### 5.2.5 Hand lever position "L"



### 6 Ordering code

#### 6.1 Inlet module

SC 22 - K 1 1 - 1 1 3 - 280 - 35 - 45 - 0 - A - Z

SC = Proportional valve in sectional design

22 = Nominal size

**Circuit options: see section 7.1**

G = without aux. valve

M = with system pressure relief, EUM<sup>1)</sup> optional

K = with system pressure relief, pilot-pressure conditioning (pressure reducing and pressure relief), optional pilot-oil supply shut-off, EUM<sup>1)</sup> optional,  $\Delta p$ -peak cut-off valve optional, ports for external pilot-oil filtration optional.

V = 3-way pressure compensator

1 = with ports for external pilot-oil filtration (standard)

0 = without ports for external pilot-oil filtration

1 = with LS unloading (standard)

0 = without LS unloading

0 = without pilot-pressure shut-off (standard)

1 = with pilot-pressure shut-off (only possible with K)

0 = without pressure-peak reducing valve 50 bar

1 = with pressure-peak reducing valve 50 bar,  $Q_{max} = 30$  l/min (not in combination with EUM<sup>1)</sup>)

2 = with pressure-peak reducing valve / circulating pump valves  $Q_{max} = 60$  l/min (higher flow rates on request)

1 = pilot-pressure supply "X" internal / pilot-pressure drain "y" internal

2 = pilot-pressure supply "X" internal / pilot-pressure drain "y" external

3 = pilot-pressure supply "X" external / pilot-pressure drain "y" internal

4 = pilot-pressure supply "X" external / pilot-pressure drain "y" external

... = system pressure relief in bar

000 = with circuit option G

... = pilot-pressure reducing in bar (standard 35 bar)

00 = with circuit options G and V

... = pilot-pressure relief in bar (standard 45 bar)

00 = with circuit options G and V

0 = without EUM<sup>1)</sup>

2 = with EUM<sup>1)</sup> (not in combination with pressure-peak reducing valve 1)

... = series identifier (e.g. A)

... = special feature as per description (e.g. Z)

1) EUM = Electronic Undersupply Management.  
Prevents stand still of loads in undersupply situations. More informations see data sheet 301-P-9050091

## 6.2 End module

SC 22 - E 1 1 - 1 0 0 - A - Z

SC = proportional valve in sectional design

22 = nominal size

E = end plate

1 = with P-port (standard)

0 = without P-port

1 = with T-port (standard) with connection TA-TB

0 = without T-port

1 = with XL-port (standard)

0 = without XL-port

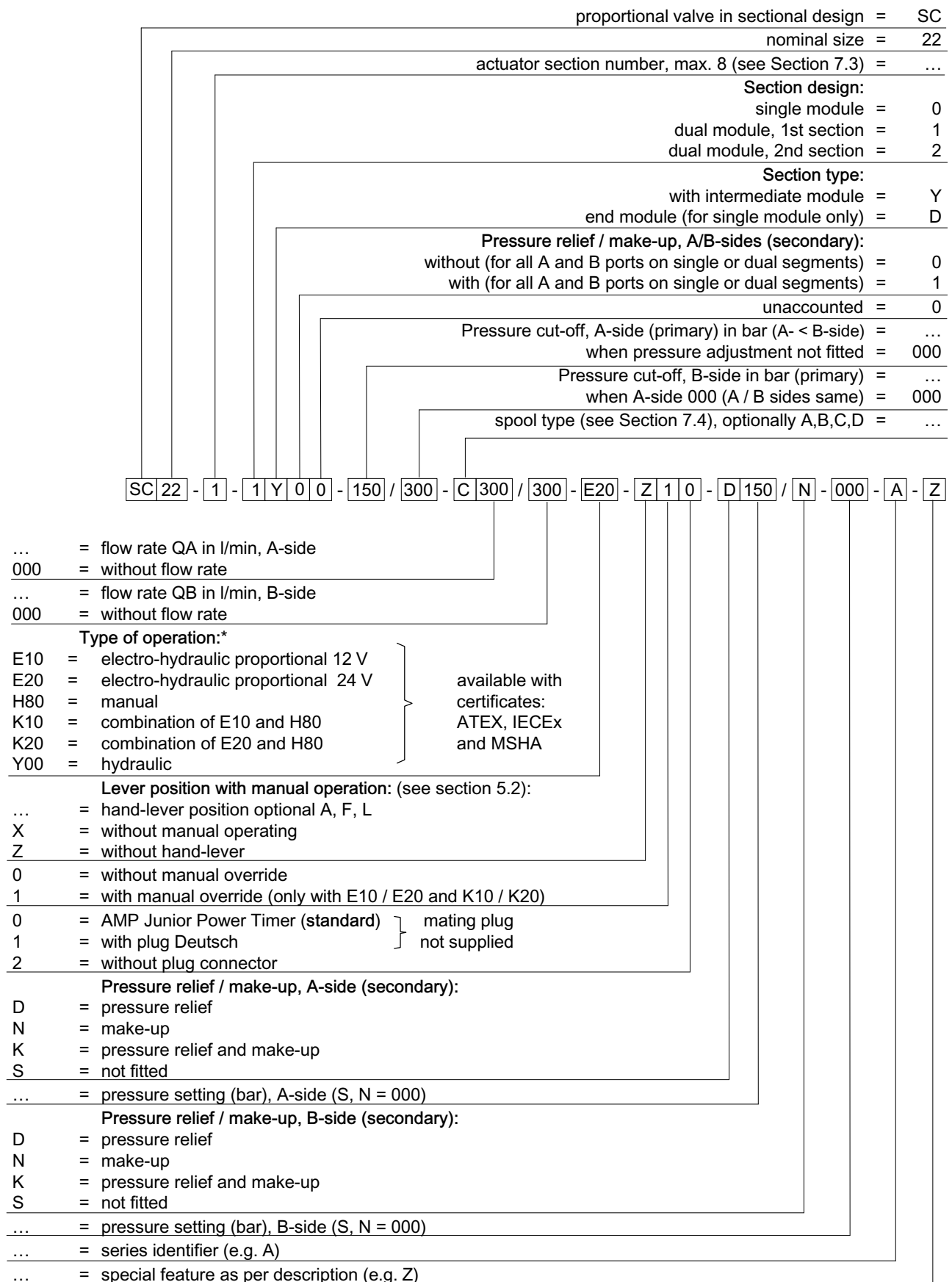
0 = without pilot-oil supply X

0 = without pilot-oil drain Y2

... = series identifier (e.g. A)

... = special feature as per description (e.g. Z)

## 6.3 Actuator module

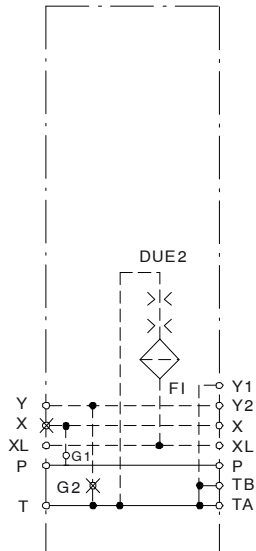


\* other types of operation on request

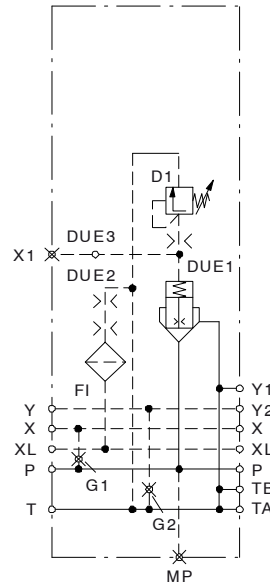
## 7 Modules

### 7.1 Inlet modules

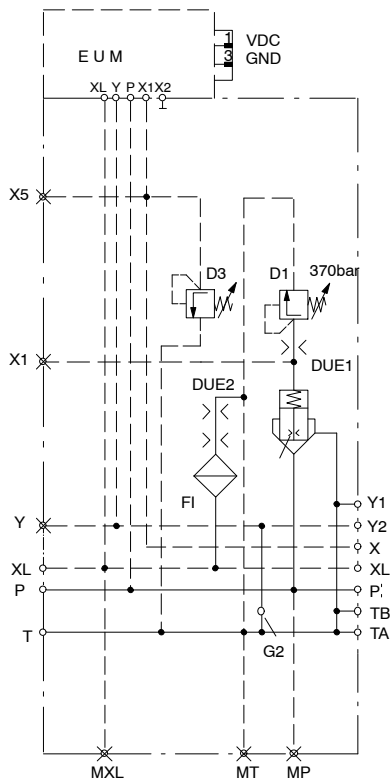
#### 7.1.1 SC22-G



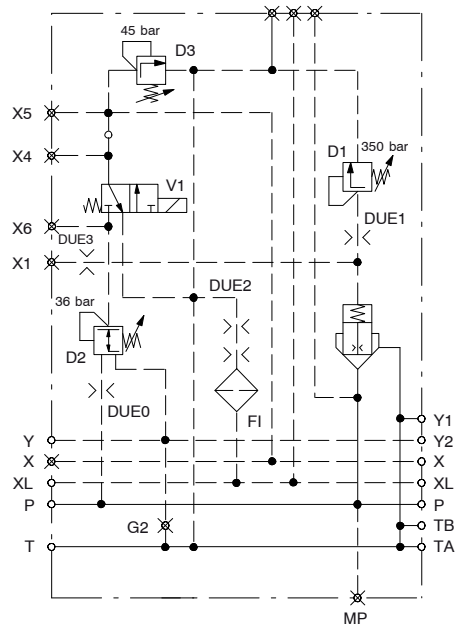
#### 7.1.2 SC22-M



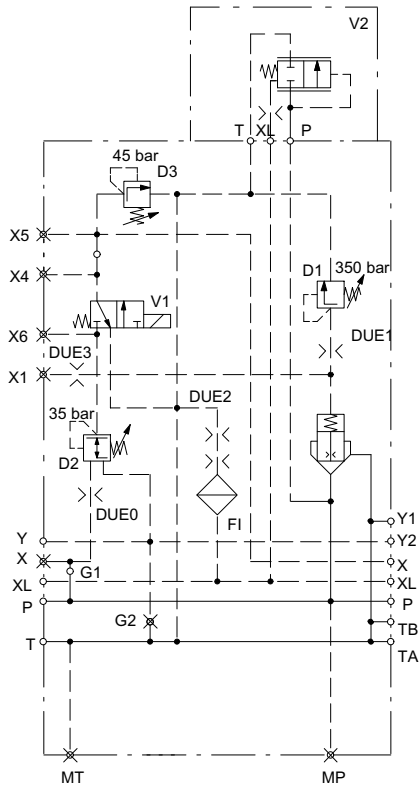
#### 7.1.3 SC22-M (EUM)



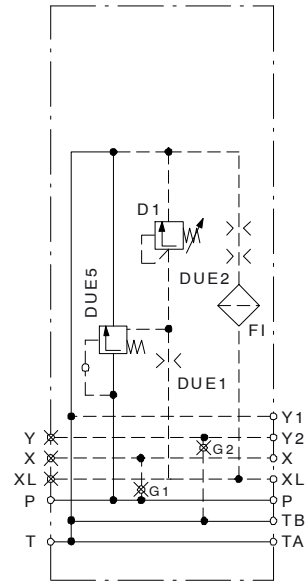
#### 7.1.4 SC22-K ... 0



## 7.1.5 SC22-K ... 1

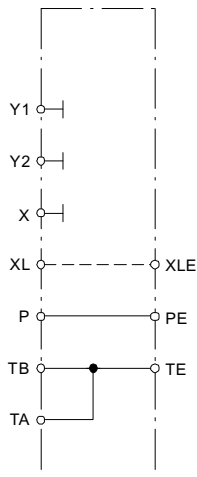


## 7.1.6 SC22-V

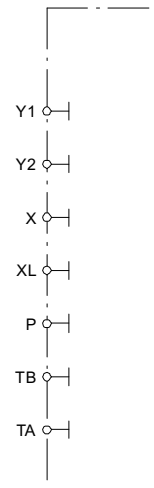


## 7.2 End module without actuator section

### 7.2.1 SC22-E11-100

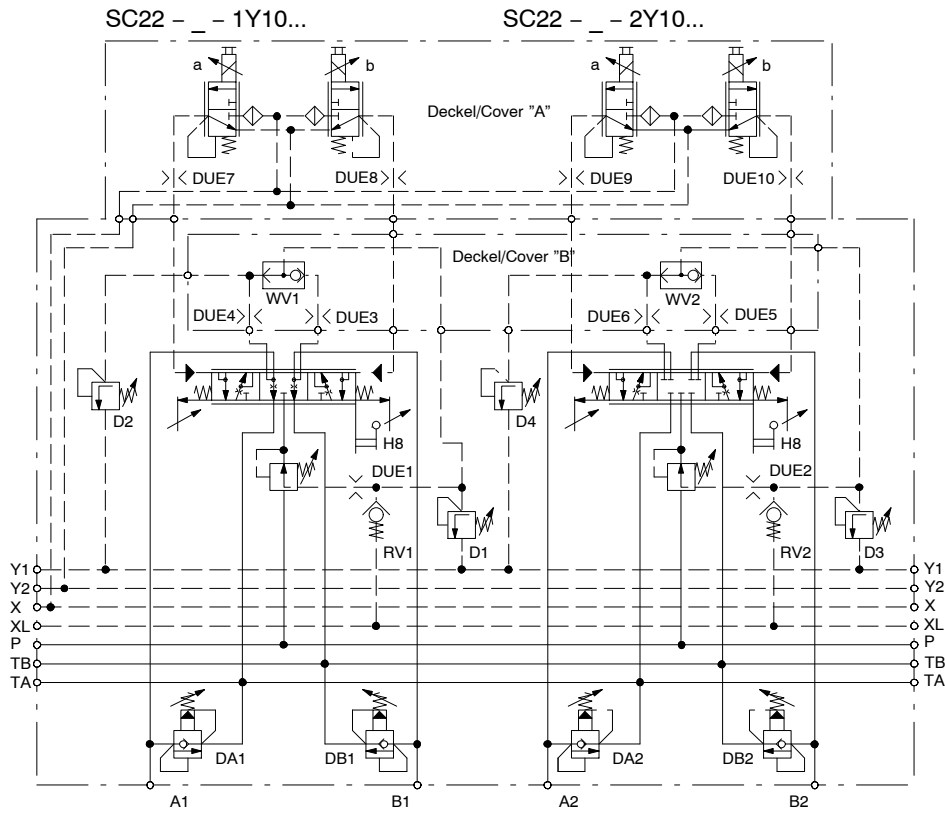


### 7.2.2 SC22-E00-000

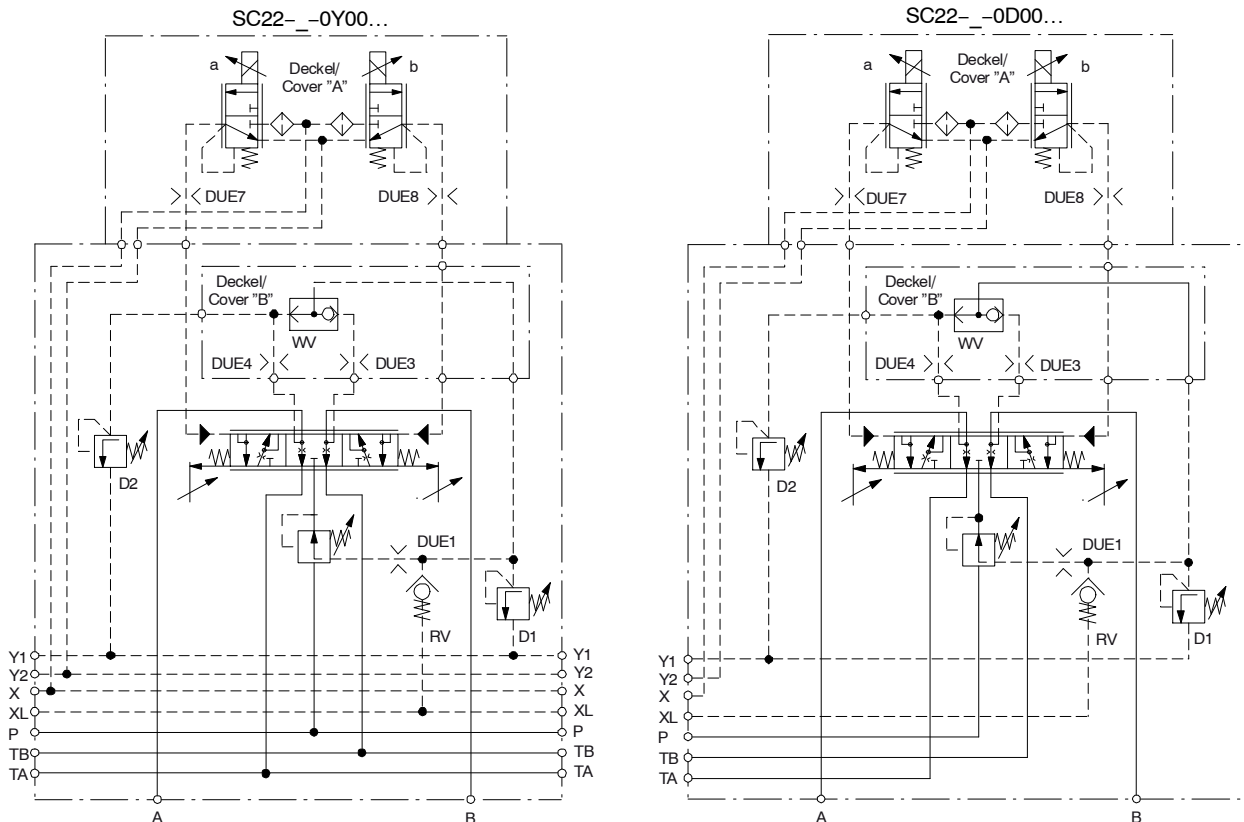


### 7.3 Actuator modules

#### 7.3.1 Two actuator sections in one intermediate module



#### 7.3.2 One actuator section as intermediate module or end module



## 7.4 Spool type / Symbol

5/3 way functions	Description for ordering code
	A
	B
	C
	D

## 8 Fluid

The oil for SC22 products must have a minimum cleanliness level of 20/18/15 to ISO 4406 or class 9 to NAS 1638.

We recommend the use of fluids that contain anti-wear additives for operation with boundary lubrication. Fluids without appropriate additives reduce the service life of pumps and motors. The user is responsible for maintaining, and regularly checking, the fluid quality. Bucher Hydraulics recommends a Brugger EN/DIN 51347 load capacity  $\geq 30 \text{ N/mm}^2$ . This is particularly important in applications with variable-speed drives and speeds  $< 1000 \text{ rpm}$ .

## 9 Note

This catalogue is intended for users with specialist knowledge. The user must check the suitability of the equipment described herein in order to ensure that all of the conditions necessary for the safety and proper functioning of the system are fulfilled. If you have any doubts or questions concerning the use of these pumps, please consult Bucher Hydraulics.

## 10 Fluid cleanliness

Cleanliness class (RK) onto ISO 4406 and NAS 1638

Code ISO 4406	Dirt particle number / 100 ml			
	$\leq 4 \mu\text{m}$	$\leq 6 \mu\text{m}$	$\leq 14 \mu\text{m}$	NAS 1638
23/21/18	8000000	2000000	250000	12
22/20/18	4000000	1000000	250000	-
22/20/17	4000000	1000000	130000	11
22/20/16	4000000	1000000	64000	-
21/19/16	2000000	500000	64000	10
20/18/15	1000000	250000	32000	9
19/17/14	500000	130000	16000	8
18/16/13	250000	64000	8000	7
17/15/12	130000	32000	4000	6
16/14/12	64000	16000	4000	-
16/14/11	64000	16000	2000	5
15/13/10	32000	8000	1000	4

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Classification: 430.300.