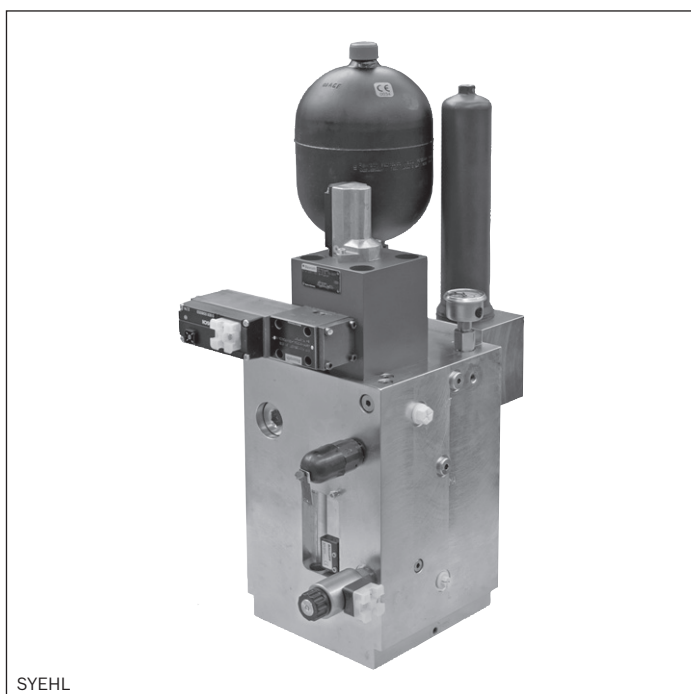


# Punching axis for nibbling machines

Type SYEHL

**RE 30200**

Edition: 2012-11



SYEHL

- ▶ Component series 2X
- ▶ Maximum operating pressure 315 bar
- ▶ Punching force 200/300 kN

## Features

- ▶ Highly dynamic "flow-optimized" valves (booster/servo technology)
- ▶ Continuous concept with standardized, optimized 200 kN and 300 kN punching cylinder axes
- ▶ Punching rates 600, 750, 900, 1200 and 1600 strokes/min
- ▶ Maximum value which can shortly be achieved in the engraving/signing mode
  - 3000 strokes/min with 3 mm stroke or
  - 4000 strokes/min with 1 mm stroke
- ▶ Operating modes punching/nibbling, engraving/signing, deep drawing/reforming, soft punch (noise reduction, not for standard variant)
- ▶ Cylinders with low-friction seal suitable for highest velocities > 2 m/s, accuracies < 0.01 mm, smallest strokes of 1 mm can be realized
- ▶ Digital position sensor (5 µm resolution) allows for highest positioning accuracies and clearly reduced temperature drift
- ▶ Energy-efficient punching/reforming due to energy-optimized (HP-LP) switching
- ▶ Very compact cylinder axis design

## Contents

Features	1, 2
Ordering code	2
Preferred types	3
Function	3
Block diagrams	4
Basic motion sequence	5
Short description of the functions	5, 6
Performance data	7
Technical data	8
Accessories	9
Device dimensions	10 ... 16

Information on available spare parts:  
[www.boschrexroth.com/spc](http://www.boschrexroth.com/spc)

## Features (continued)

- ▶ Standardized, clear and simple mechanical-hydraulic-electric interfaces for integration into the machine concept
- ▶ Highly dynamic digital controller with cycle times of less than 0.5 ms for the selection of most different operating modes such as:
  - Punching, nibbling
  - Engraving/signing
  - Soft punch (noise reduction)
  - Deep drawing/reforming
  - Thread forming and many more with highest precision
- ▶ Highest availability due to robust valve and sensor technology
- ▶ Standardized power units with optimized output adjustment (pressure control pumps)
- ▶ Reduction of the power unit standby power by 50 % (pressureless circulation)
- ▶ Technically optimized, tried and tested products, adjusted to each other:
  - Higher productivity, highest reliability and long life cycle
  - Highest dynamics with highest precision and superior functionality
- ▶ More customer-specific options:
  - Cylinder forces and cylinder stroke lengths
  - Customer-specific power units/cylinder axes
  - Customer-specific interfaces/mounting possibilities
  - Controller: Customer-specific hardware and software

## Ordering code

01	02	03	04	05	06	07	08	09				
SYEHL	-	2X	/		-	040		-		-		*

01	System Electrohydraulic Linear Drive	SYEHL
02	Component series 20 to 29 (20 to 29: Unchanged installation and connection dimensions)	2X

### Punching rate

03	1600 strokes/min (high 1600)	1600
	1200 strokes/min (high 1200)	1200
	0900 strokes/min (advanced)	0900
	0750 strokes/min (standard 750)	0750
	0600 strokes/min (standard 600)	0600

### Stroke length

04	40 mm	040
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### Punching force

05	200 kN (20 t)	020
	300 kN (30 t)	030

### Valve type

06	High-response valve with servo pilot (currently for up to 1600 strokes/min)	1
	High-response valve with proportional pilot (currently for 900 strokes/min)	2
	Pilot operated on/off valve (currently for up to 750 strokes/min)	3

### Position measurement system

07	Incremental 5 µm	1
08	Special versions	
09	Further details in the plain text	*

## Preferred types

300 kN	
Type	Material number
SYEHL-2X/0600-040-030-3-1	<b>R901246498</b>
SYEHL-2X/0750-040-030-3-1	<b>R901304615</b>
SYEHL-2X/0900-040-030-2-1	<b>R901251601</b>
SYEHL-2X/1200-040-030-1-1	<b>R901251917</b>
SYEHL-2X/1600-040-030-1-1	upon request

200 kN	
Type	Material number
SYEHL-2X/0600-040-020-3-1	<b>R901259292</b>
SYEHL-2X/0750-040-020-3-1	upon request
SYEHL-2X/0900-040-020-2-1	<b>R901259291</b>
SYEHL-2X/1200-040-020-1-1	<b>R901259290</b>
SYEHL-2X/1600-040-020-1-1	upon request

## Function

The SYEHL punching axis is a complete, electro-hydraulic, highly dynamic, compact, position-controlled linear axis. This system is controlled via a pilot operated high-response valve [2] with vibration-proof electronics. Depending on the performance class, the pilot operated high-response valve is equipped with a servo, proportional or a boosted on/off valve pilot. In connection with powerful plate feed drives, punching rates of up to 1600 double strokes per minute can be achieved with these punching axes.

By closing and opening, the relevant valve determines the feed of the differential cylinder [1]. The pump pressure is permanently applied to the annulus area of the differential cylinder. Consequently, it is retracted in the initial condition. Even in case of power failure, it has an integrated safety function, opening the valve from A to T if pilot pressure is applied and thus ensuring that the cylinder is retracted. Upon operation of the valve, pump pressure is applied to the cylinder piston area; the cylinder is extended due to the piston area ratio.

The actual cylinder position value is recorded by means of a digital position transducer [3]. In order to ensure high

dynamics of the axis, the high-response valve is controlled by the HNC100 axis control especially optimized for that purpose. This axis control processes all necessary control signals which are necessary for operating the SYEHL axis in real time.

Via the valve amplifiers, the actuating value of the cylinder position controller generates the current for the pilot valve. The punching axis has one high- and one low-pressure circuit. In normal operation, the system works with energy-efficient low pressure and only switches to high pressure if forces > 50 kN are required. The pressure is switched hydraulically via the pressure switch valve [4]. Upon retraction of the cylinder, the attached accumulator dampens the oil quantity flowing back to the tank.

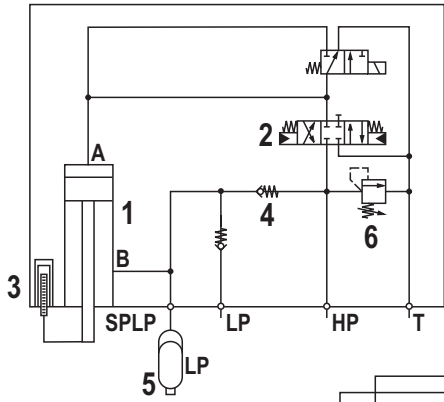
In order to achieve maximum dynamics, hydraulic accumulators [5] are used.

For system and accumulator protection, pressure relief valves [6] and accumulator discharge valves are integrated into the punching axis.

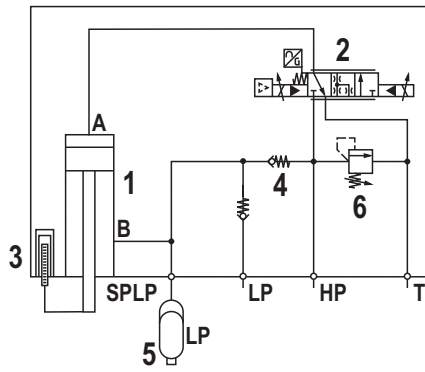
[ ] ... Cross-reference to block diagrams

## Block diagrams

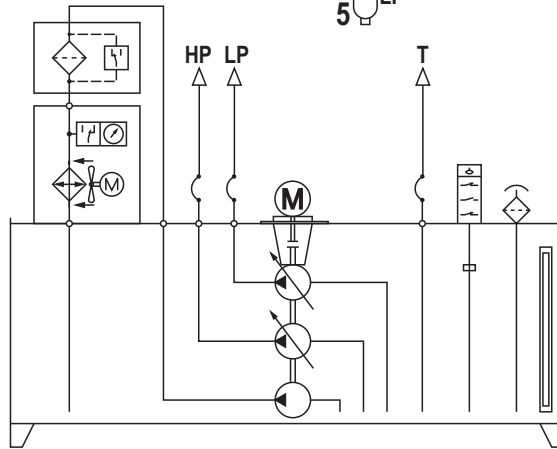
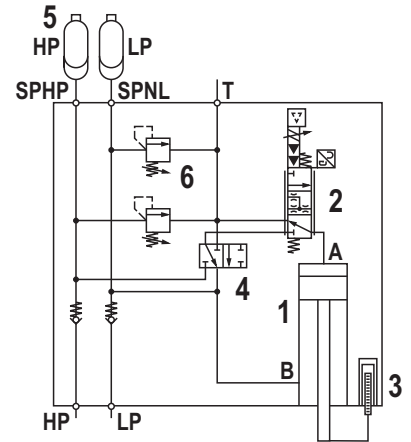
Standard performance



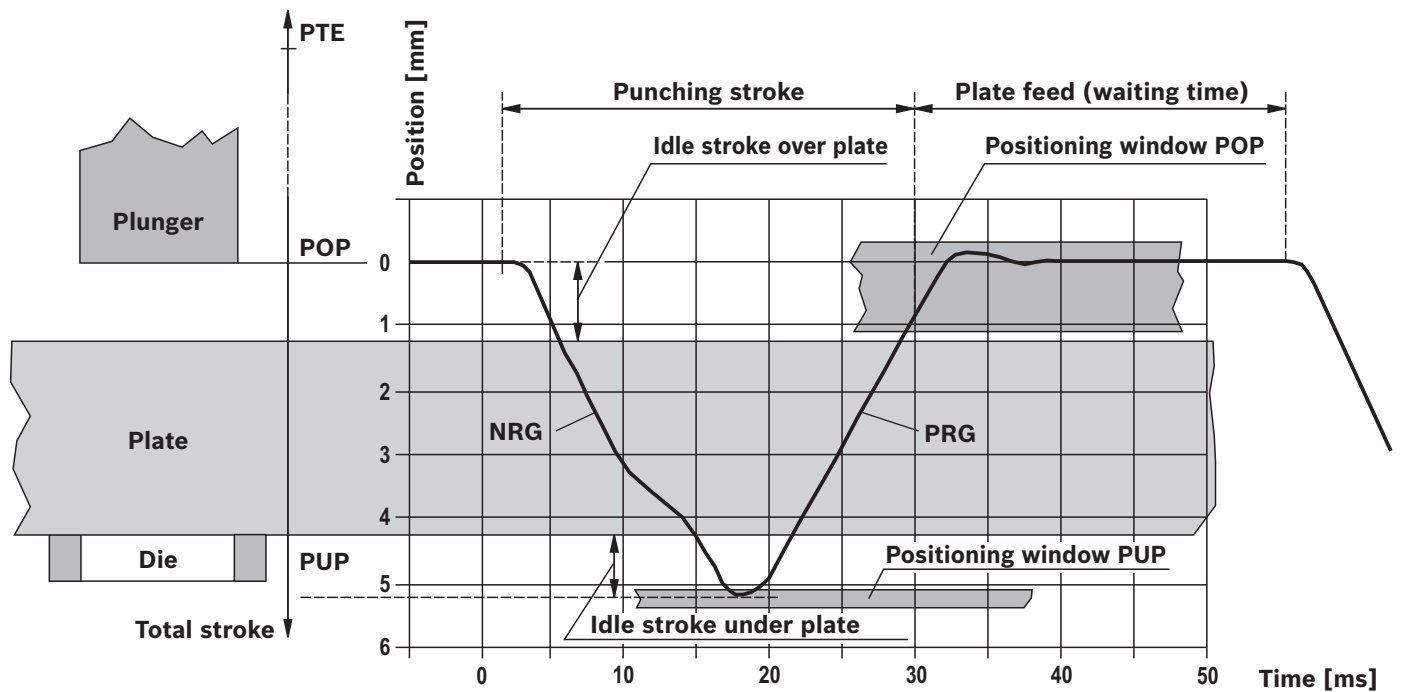
Advanced performance



High performance



### Basic motion sequence



- PTE = Position Tool Exchange
- POP = Position Over Plate
- PUP = Position Under Plate
- NRG = Negative Ramp Gradient (speed for the downward movement – extension)
- PRG = Positive Ramp Gradient (speed for the upward movement – retraction)

### Short description of the functions

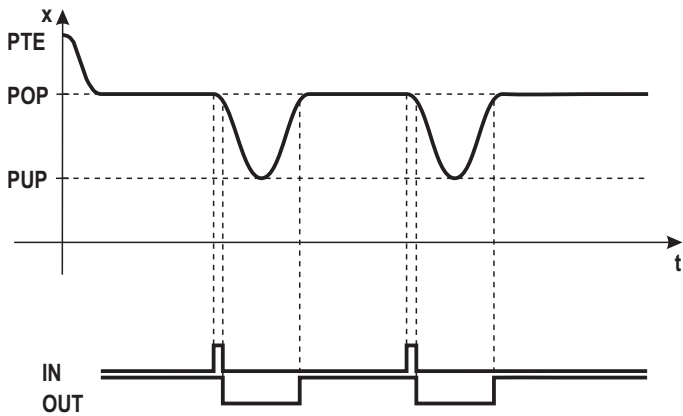
	Standard 600/750	Advanced 900	High 1200/1600
Functions	Punching/nibbling and signing, reforming	Punching/nibbling, reforming, signing and soft punch	
Emergency stop behavior, power failure	In the de-energized state or if the valve enable is removed, the axis moves into the top end position if hydraulic pressure is available. If the hydraulic system is de-pressurized, the piston may drift downwards.		
Switch-on behavior	If valve enable is not set, the axis will - after switch-on of the hydraulic pressure - remain in the top fixed stop or return there if it slowly dropped when it was switched off.		

For a more detailed description of the functions please refer to the operating instructions 30201-B.

## Short description of the functions

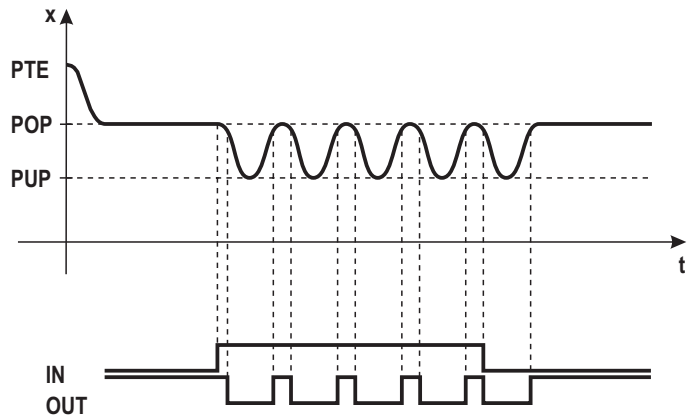
### Nibbling/punching

- ▶ Traveling individual punching strokes.
- ▶ The SYEHL punching axis moves in a synchronized manner with the plate-moving "X and Y" axes.



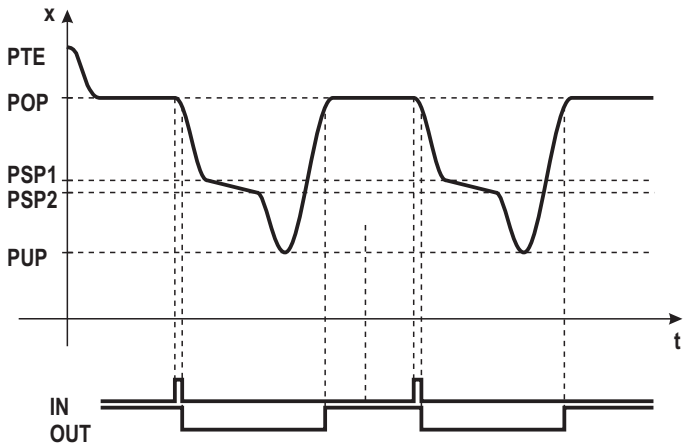
### Engraving/signing

- ▶ The SYEHL punching axis moves without synchronization with the plate-moving "X and Y" axes.
- ▶ The plate moves continuously and does not stop when the tool penetrates the plate.
- ▶ Engraving is used in order to apply labels or symbols to plates.



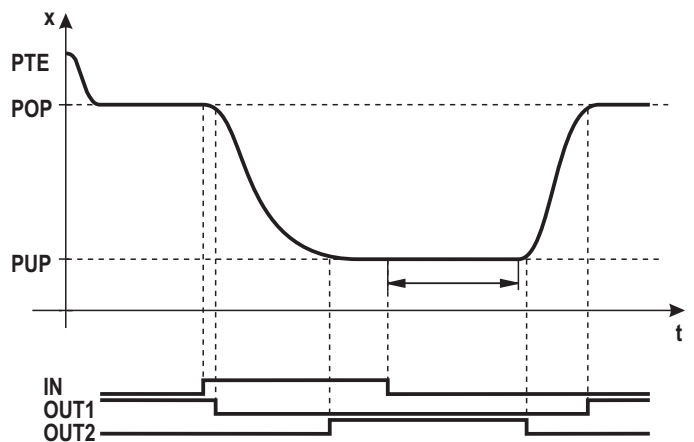
### Soft punch

- ▶ Between the PSP 1 and PSP 2 positions (position SoftPunch 1 and 2), the SYEHL punching cylinder moves downwards with reduced speed in order to minimize impact hits.



### Deep drawing/reforming/repositioning/rolling

- ▶ Embossing or forming using special tools.
- ▶ POP is the rest position over the plate, PUP is the reforming position in the plate.
- ▶ Repositioning: Plate is clamped in the PUP position.



## Performance data

	200 kN					300 kN				
	Standard		Advanced	High		Standard		Advanced	High	
	600	750		1200	1600	600	750		1200	1600
Possible stroke frequency [1/min] of a nibbling machine with 4 mm stroke	600	750	900	1200	1600	600	750	900	1200	1600
Engraving/signing 1 mm	1100 <sup>1)</sup>	1100 <sup>1)</sup>	2600	4000	4000	950 <sup>1)</sup>	1100 <sup>1)</sup>	2200	3000	3500
Typical selection of the power unit output (nominal power) [kW]	7.5	7.5	7.5	11	15	11	11	11	15	18.5
Punching stroke time [ms]	3 mm		24	20	16			30	24	20
	4 mm	48	38	28	24	18	50	40	34	28
	6 mm	54	44	34	30	24	65	55	40	34
	10 mm	95	70	50	40	32	105	80	56	44
Nominal pressure punching force	200 kN with HP 280 bar and LP 80 bar					300 kN with HP 290 bar and LP 80 bar				
Radial force, load on rod side	no radial force admissible									

<sup>1)</sup> with 4 mm signing stroke

### Example according to preceding power table:

200 kN, high performance	1200 strokes/min	200 kN, high performance	1600 strokes/min
Punching stroke time for 4 mm stroke:	24 ms	Punching stroke time for 4 mm stroke:	18 ms
Typical plate moving time:	26 ms	Plate moving time:	19 ms
Total time:	50 ms	Total time:	37 ms
Results in a stroke frequency of:	1200 strokes/min	Results in a stroke frequency of:	1600 strokes/min

More cylinder axis sizes upon request.

**Technical data** (For applications outside these parameters, please consult us!)

<b>general</b>					
<b>Design</b>		<b>Standard 600/750</b>	<b>Advanced 900</b>	<b>High 1200/1600</b>	
Weight	▶ 200 kN	kg	approx. 100	approx. 117	approx. 160
	▶ 300 kN	kg	approx. 100	approx. 117	approx. 160
Maximum mechanical stroke length		mm	40		
Maximum working stroke		mm	35		
Minimum stroke length		mm	4	3 (1 mm for max. 20 m. strokes)	
Typical working stroke		mm	3 ... 10		
Installation position			vertical, piston downwards		
Ambient temperature range		°C	+5 ... +40		
Storage temperature range		°C	0 ... +50		
Repetition accuracy	▶ Punching <sup>4)</sup>	mm	< ±0.3	< ±0.15	< ±0.05
	▶ Reforming <sup>4)</sup>	mm	< ±0.1	< ±0.05	< ±0.05

<b>hydraulic</b>					
<b>Design</b>		<b>Standard 600/750</b>	<b>Advanced</b>	<b>High 1200/1600</b>	
Maximum operating pressure	▶ HP, LP	bar	315		
	▶ Port L	bar	3		
	▶ Port D	bar	1 <sup>1)</sup>		
	▶ Port T	bar	20 <sup>1)</sup>		
Operating range	▶ High pressure HP	bar	90 ... 315		150 ... 315
	▶ Low pressure LP	bar	70 ... 80 (typ. 80)		
Hydraulic fluid			Mineral oil HLP 46 according to DIN 51524/2 2006; other hydraulic fluids on request		
Hydraulic fluid temperature range <sup>2)</sup>		°C	+20 ... +50 Short-time 5...60 (admissible for maximally 10 % of the duty cycle, performance data cannot be complied with in this range)		
Viscosity range		mm <sup>2</sup> /s	1.5 ... 380, preferably 30 ... 45		
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)/NAS 1638 <sup>2)</sup>			NAS 1638 class 7 or ISO 4406 class 18/16/13	NAS 1638 class 5 or ISO 4406 class 16/14/11	
Duty cycle		ED	100 % (continuous operation) (engraving ED 10 %)		
Maximum line length (hydraulics)		m	6, longer lines upon request		

<b>electric</b>				
<b>Design</b>		<b>Standard 600/750</b>	<b>Advanced</b>	<b>High 1200/1600</b>
Control		VT-HNC100		SYHNC100-NIB
Maximum line length	m	20, longer lines upon request		
Voltage type		Direct voltage		
Supply voltage	V	24		
Voltage tolerance (nominal voltage)	%	±10, residual ripple < 10 %		
Max. (average) power consumption	W	240 (110)	100 (70)	70
Duty cycle		S1 (continuous operation)		

<sup>1)</sup> Lead the tank line and the D line to the tank without restrictions and throttling points. For details refer to the operating instructions 30201-B.

<sup>2)</sup> The performance data can only be complied with in this temperature range.

<sup>3)</sup> The cleanliness classes stated for the components need to be

maintained in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components. For the selection of the filters see [www.boschrexroth.com/filter](http://www.boschrexroth.com/filter).

<sup>4)</sup> with 40 ... 50 °C oil temperature

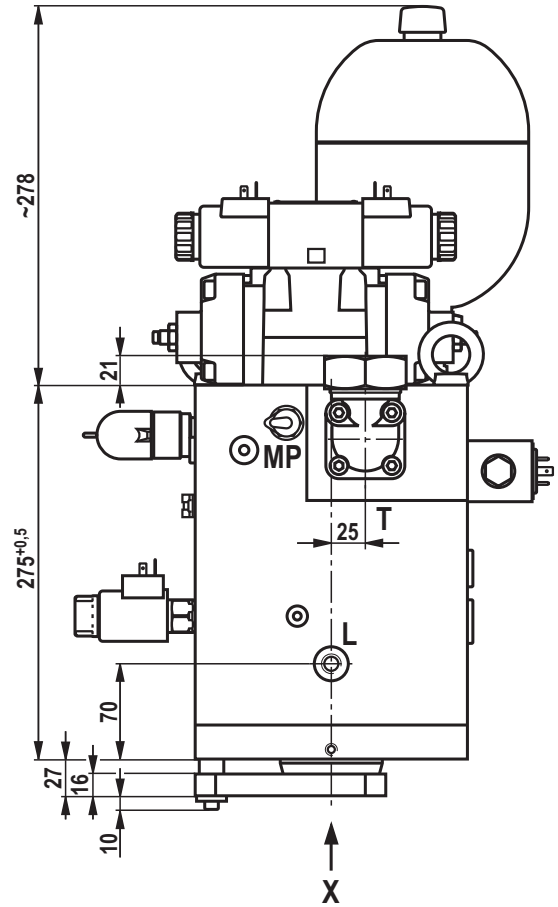
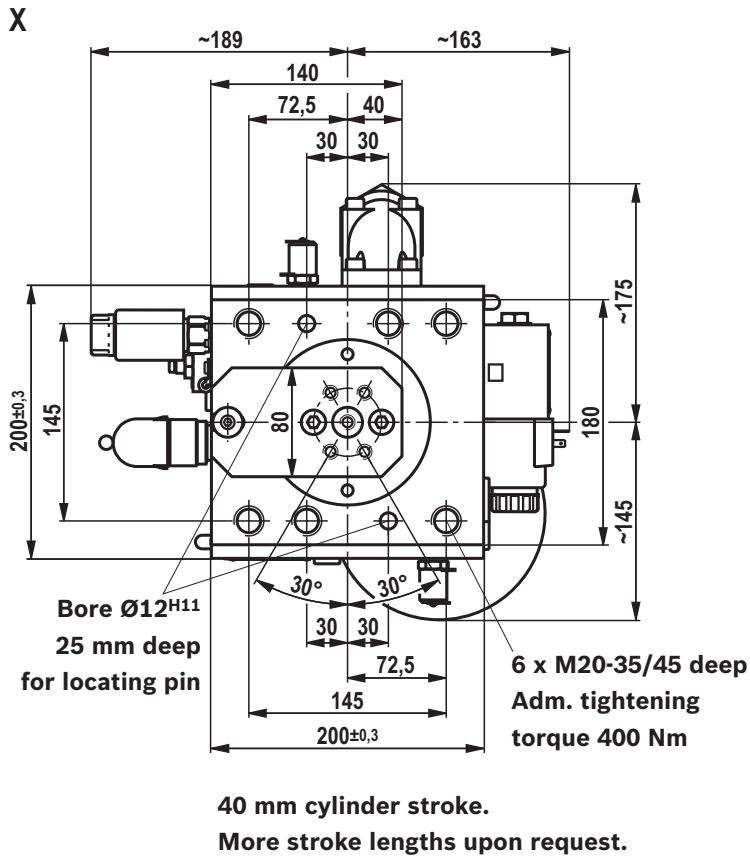
**Accessories** (For applications outside these parameters, please consult us!)

<b>Mating connector for "High" variant</b>		<b>Material number</b>
For high-response valve STW243	MATING CONNECTOR 7PZ31BF6-3PG11KSPEZ 6P+PE, Pg11	<b>R900021267</b>
For HP accumulator charging valve 4WE6Y73	1 Z4 connector – selection: – Z4 connector with free-wheeling diode with cable 5 m – Z4 connector with free-wheeling diode with cable 10 m – Z4 connector with protection circuit – Z4 connector with protective diode	<b>R900032015</b> <b>R900217138</b> <b>R901017026</b> <b>R901017027</b>
For pressure sensor HM 16-1X/315C13-A	Mating connector with cable 5 m	<b>R900779498</b>
For accumulator discharge valve KSDER1PB/HNOV	1 Z4 connector – selection: – Z4 connector with free-wheeling diode with cable 5 m – Z4 connector with free-wheeling diode with cable 10 m – Z4 connector with protection circuit – Z4 connector with protective diode	<b>R900032015</b> <b>R900217138</b> <b>R901017026</b> <b>R901017027</b>

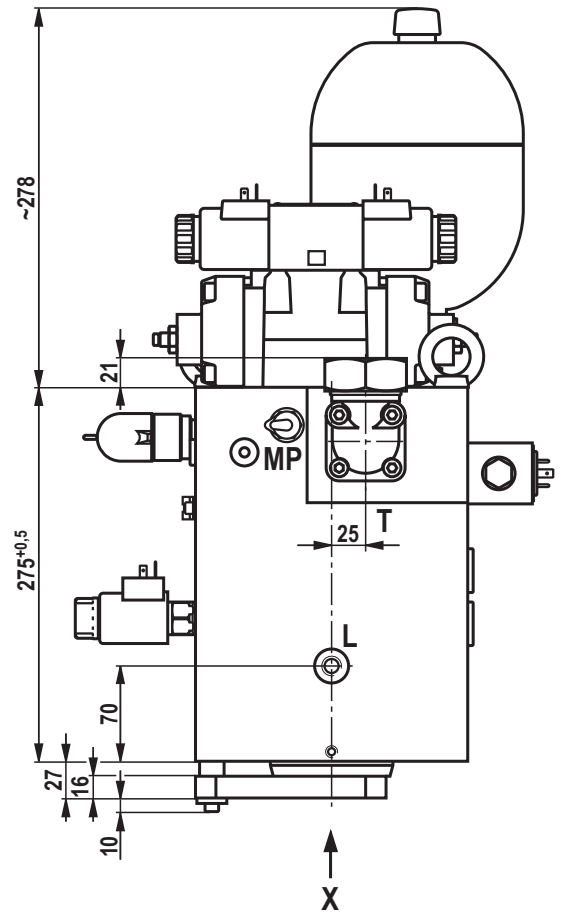
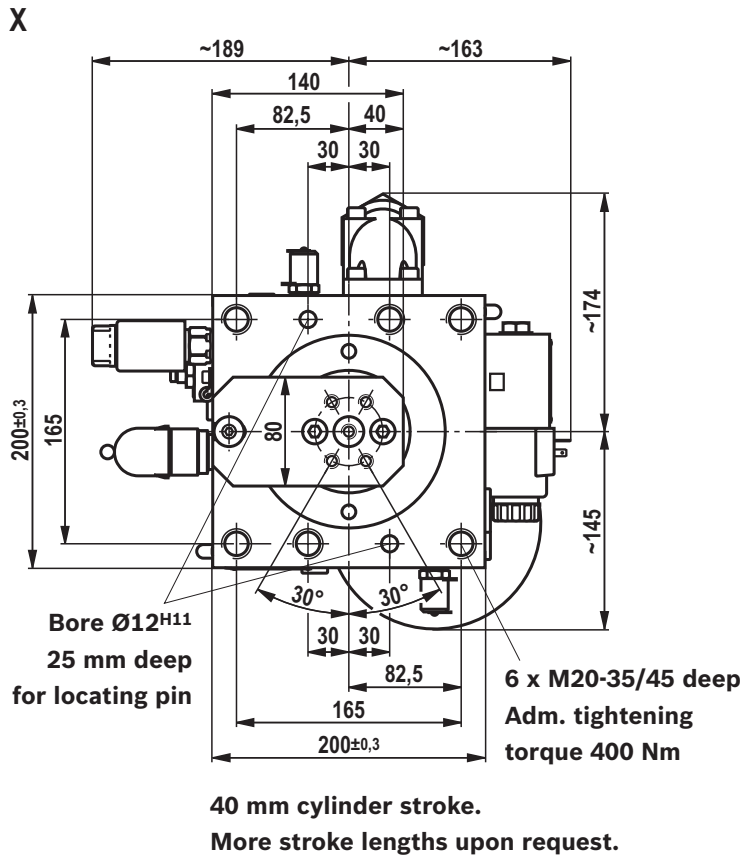
<b>Mating connector for "Advanced" variant</b>		<b>Material number</b>
For high-response valve STW0357-1X	1 MATING CONNECTOR 3PZ4MSWSPEZ Z4 connector - 2P+PE, M16x1.5 1 cable set M12 – selection: – Cable set M12 x 1, 4-pole, straight, with cable 2 m – Cable set M12 x 1, 4-pole, straight, with cable 5 m – Cable set M12 x 1, 4-pole, angled, with cable 2 m – Cable set M12 x 1, 4-pole, angled, with cable 5 m	<b>R901017011</b>  <b>R900773031</b> <b>R900779498</b> <b>R900779504</b> <b>R900779503</b>
For accumulator discharge valve KSDER1PB/HNOV	1 Z4 connector – selection: – Z4 connector with free-wheeling diode with cable 5 m – Z4 connector with free-wheeling diode with cable 10 m – Z4 connector with protection circuit – Z4 connector with protective diode	<b>R900032015</b> <b>R900217138</b> <b>R901017026</b> <b>R901017027</b>

<b>Mating connector for "Standard" variant</b>		<b>Material number</b>
For 4WEH 10 E4X/6EG	2 MATING CONNECTOR 3PZ4MSWSPEZ Z4 connector - 2P+PE, M16x1.5	<b>R901017011</b>
For accumulator discharge valve KSDER1PB/HNOV	1 Z4 connector – selection: – Z4 connector with free-wheeling diode with cable 5 m – Z4 connector with free-wheeling diode with cable 10 m – Z4 connector with protection circuit – Z4 connector with protective diode	<b>R900032015</b> <b>R900217138</b> <b>R901017026</b> <b>R901017027</b>

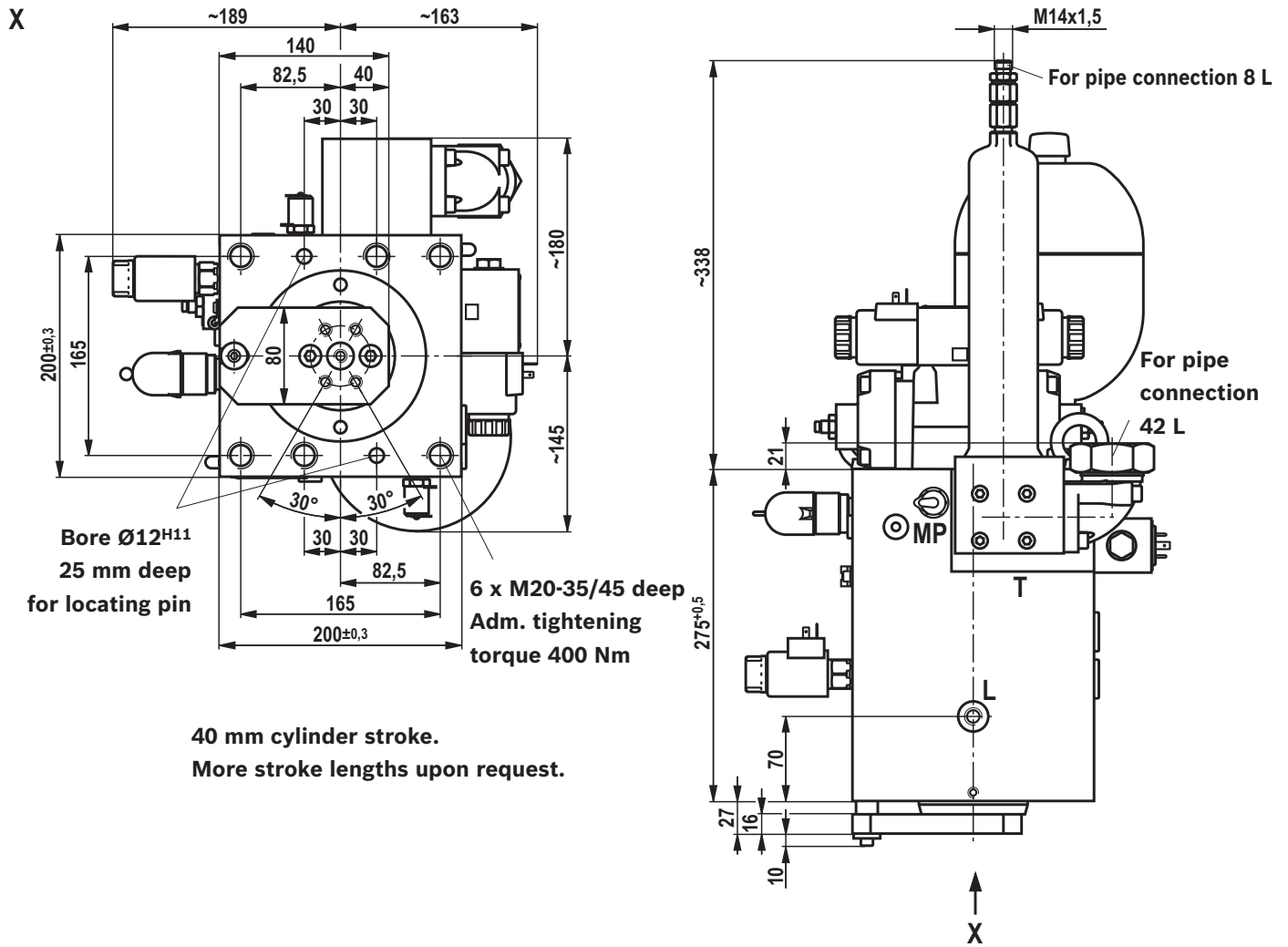
**Device dimensions: Cylinder axis 200 kN – "Standard performance" 600 strokes**  
 (dimensions in mm)



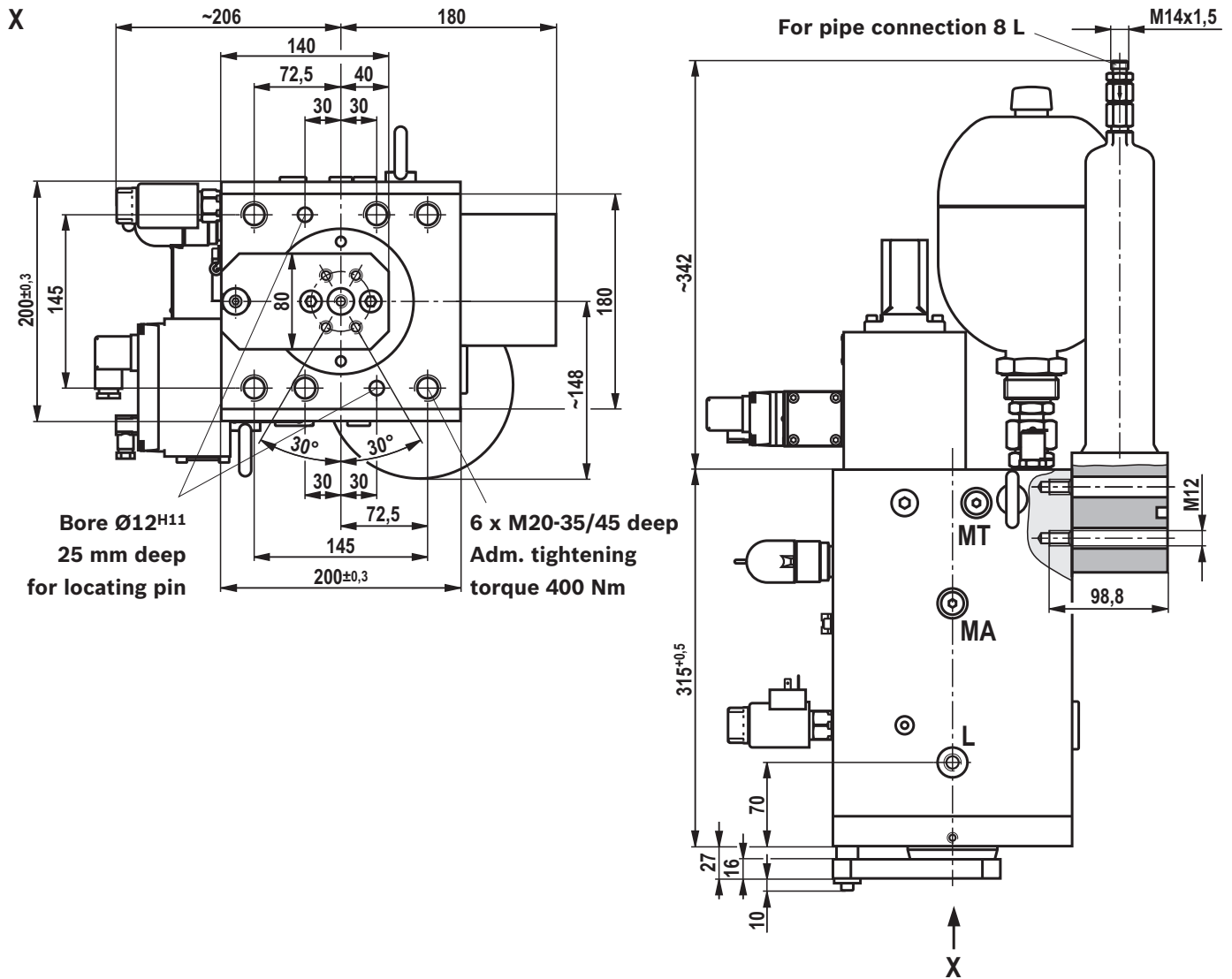
**Device dimensions: Cylinder axis 300 kN – "Standard performance" 600 strokes**  
 (dimensions in mm)



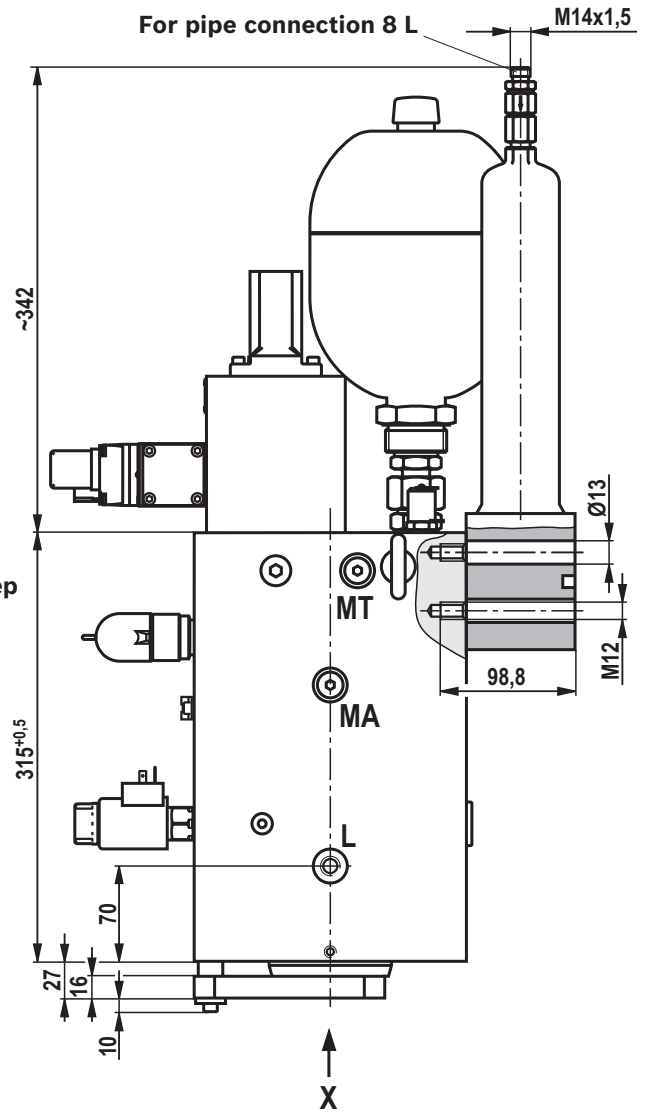
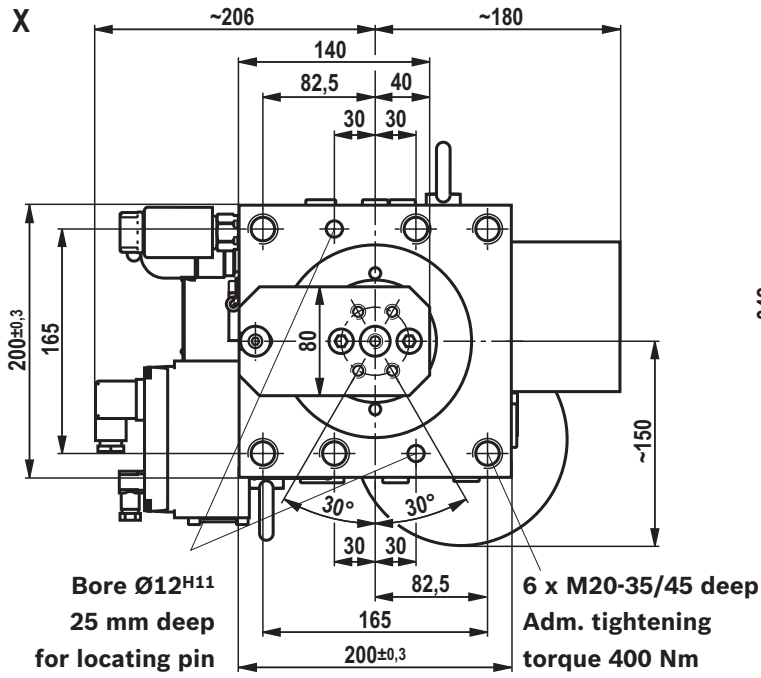
**Device dimensions: Cylinder axis 300 kN – "Standard performance" 750 strokes**  
 (dimensions in mm)



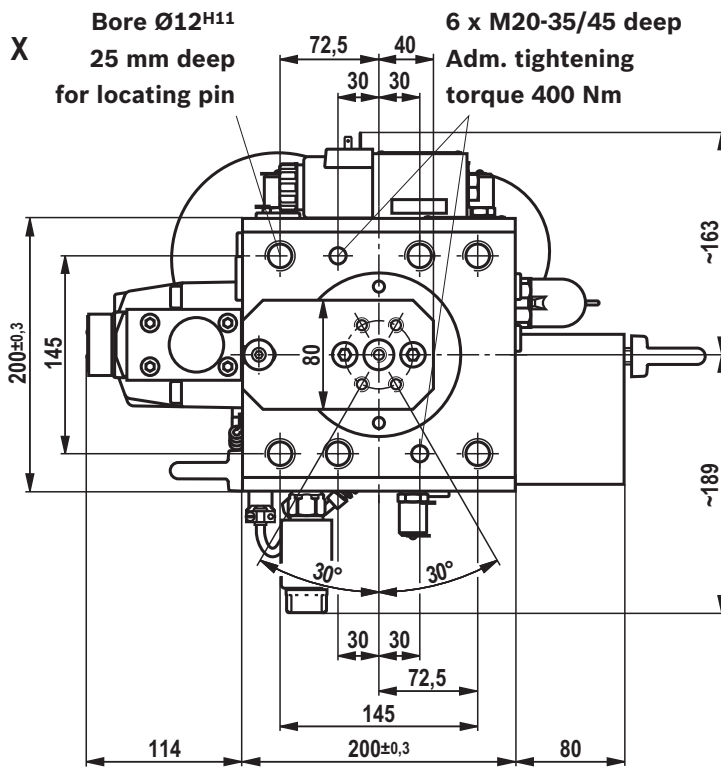
**Device dimensions: Cylinder axis 200 kN - "Advanced" 900 strokes**  
 (dimensions in mm)



**Device dimensions: Cylinder axis 300 kN - "Advanced" 900 strokes**  
 (dimensions in mm)



**Device dimensions: Cylinder axis 200 kN - "High" 1200 and 1600 strokes**  
 (dimensions in mm)



40 mm cylinder stroke.  
 More stroke lengths upon request.

