

**CES**

Process high-pressure pumps for cold liquids

# PROCESS HIGH-PRESSURE PUMPS FOR COLD LIQUIDS CES

## APPLICATION

Pumps „CES“ are intended for pumping clean liquids without mechanical impurities and corrosive effects on carbon steel and grey cast iron.

Temperature range of pumped liquid	-10 to +120 °C
Density range of pumped liquid	680 to 1200 kg.m <sup>-3</sup>
Max. kinematic viscosity of pumped liquid	60 mm <sup>2</sup> .s <sup>-1</sup>

High-pressure process pumps of CES series may be applied to petrochemical industry for pumping so called „cold“ oil products. They are available as booster pumps in technological processes in refineries with delivering oil, petrol, light oils, crude oil and further hydrocarbon components. Further, they are suitable for pumping lyes and non-corrosive water solutions.

Their using as booster pumps for long-distance water and oil products deliveries through piping systems is also meaningful.

## CONSTRUCTION

Pumps „CES“ are of centrifugal horizontal multistage type with radial-split stages and their tandem arrangement in pressure stages. Their distinctive feature is the method of hydraulic axial force relief.

Pump is divided into two halves being arranged symmetrically and back-to-back, with axial thrusts acting in opposite direction elimination one another. However, that conception allows always only even number of stages – 4, 6, 8, and so on.

### Stator

It consists of discharge casing being installed in the middle, then two side suction casings and proper number of stages with diffusers of symmetrical arrangements. Pumped liquid is di-

rected from the low-pressure half to the high-pressure one through outer transition system.

### Rotor

It consists of the shaft, impellers, spacer bushes and protective sleeves and it is balanced dynamically thoroughly. To reach forces balancing as mentioned above there is always a half of the total number of impellers in tandem arrangement with back-to-back positioning on the shaft.

### Seals

Hydraulic space is sealed on either side by gland packing or special mechanical seals.

### Bearings

Pump shaft is carried on either side in rolling-contact bearings being oiled there. Bearing oil charge is cooled with water. Random residues of the rotor axial thrust are taken up in both directions by a double-row angular-contact ball bearing being easy accessible, oil charge of which is also cooled with water.

As a standard, the pumps are provided with thermometers to have a possibility of visual inspection of lubricating oil temperature in bearings.

## MATERIAL OPTIONS

CES pumps are supplied in material option „OL“. Materials for the pump main parts are given in the Table below, however, some alterations for the benefit of quality and functional advantages are possible.

Position	Part	Material
106.1; 106.2 107	Suction casing	cast steel
109	Discharge casing	cast steel
112.1; 112.2 146 330.1; 330.2	Stage jackets	grey cast iron
231; 232 171.1; 171.2	Guide-vaned casings	grey cast iron
502.1; 502.2	Bearing pedestal	grey cast iron
211.1 ÷ 6	Bearing housings	constructional steel
520.1; 520.3 525	Impellers	chrome cast iron
513; 540 541	Diffusers	grey cast iron

## POSITION OF BRANCHES AND SENSE OF ROTATION

Suction branch is arranged horizontally on the pump right side, as viewed from the drive side, position S-90.

Discharge branch is directed upwards in vertical position above the pump axis-position T-0.

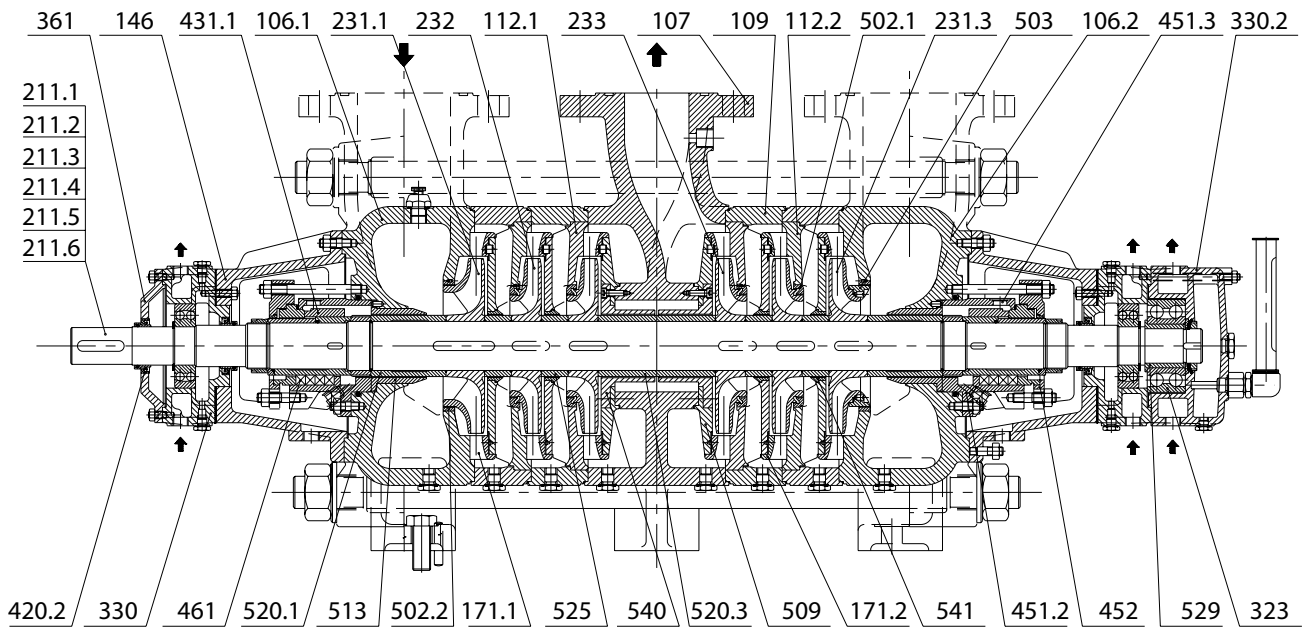
## DRIVE

Drive of „CES“ pumps is direct single-ended with an electric motor, as a rule. Torque transmission from a driving motor is through a flexible coupling.

## Coupling spacer

Coupling is designed with a spacer being inserted between both halves of the coupling. Spacer facilitates dismantling and mounting of a mechanical seal being installed on the pump drive side without any need of disconnecting or shifting either a motor or the pump, which may be often a cause of disalignment and re-balancing is often very difficult. With removing the coupling spacer there a sufficient space in axial direction between the pump shaft ends and a motor will be formed for shifting single elements or even the mechanical seal unit out.

# INFORMATORY CROSS SECTIONAL ARRANGEMENT

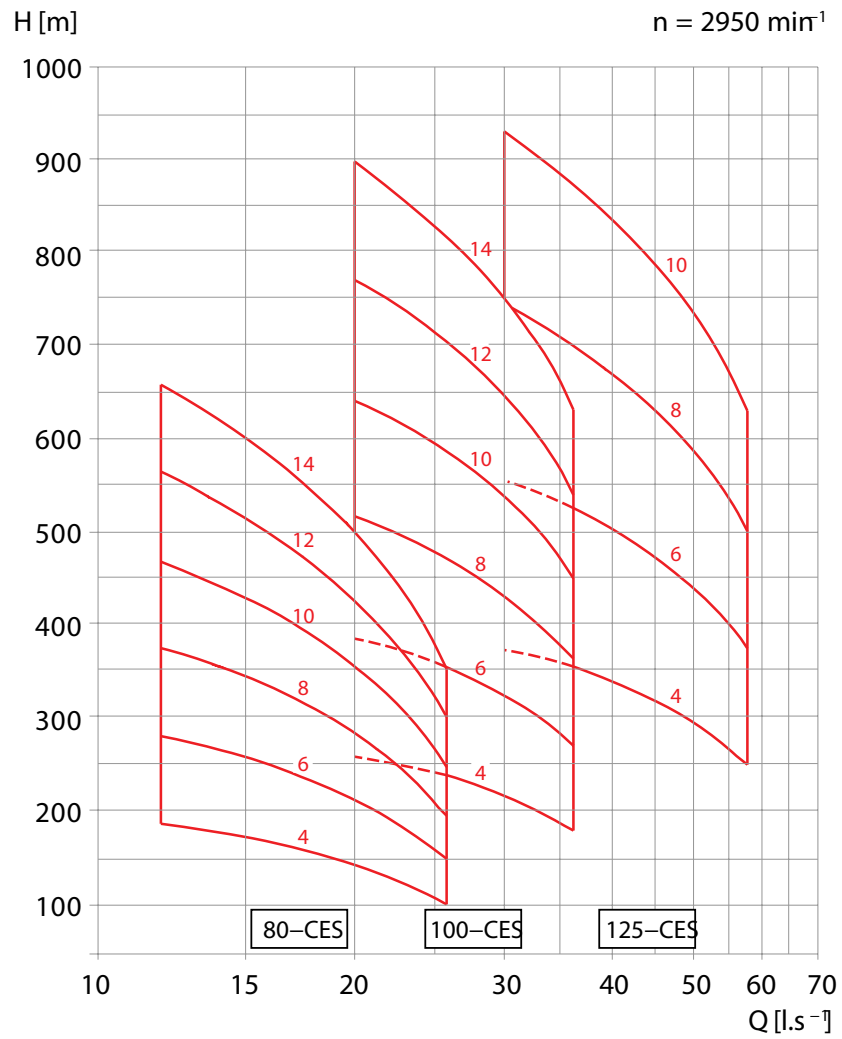


106.1	Suction casing
106.2	Suction casing
107	Discharge casing
109	Stage jacket
112.1	Right-side partition
112.2	Left-side partition
146	Bearing lantern
171.1	Right-side diffuser
171.2	Left-side diffuser
211.1	4th stage shaft
211.2	6th stage shaft
211.3	8th stage shaft
211.4	10th stage shaft
211.5	12th stage shaft

211.6	14th stage shaft
231.1	Right impeller on suction side
231.3	Left impeller on suction side
232	Right-side impeller
233	Left-side impeller
323	Thrust bearing housing
330.1	Journal bearing housing
330.2	Thrust bearing housing
361	Journal bearing cover
420.2	Radial lip seal
431.1	Mechanical seal
451.2	Gland seal housing
451.3	Mechanical seal housing
452	Gland

461	Gland packing
502.1	Wear ring
502.2	Wear ring on suction side
503	Reducing ring
509	Discharge casing plate
513	Suction casing bush
520.1	Shaft sleeve
520.3	Shaft sleeve
525	Spacer sleeve
529	Thrust bearing sleeve
540	Discharge casing sleeve
541	Spacer sleeve

# PERFORMANCE SELECTION CHART FOR PUMPS CES



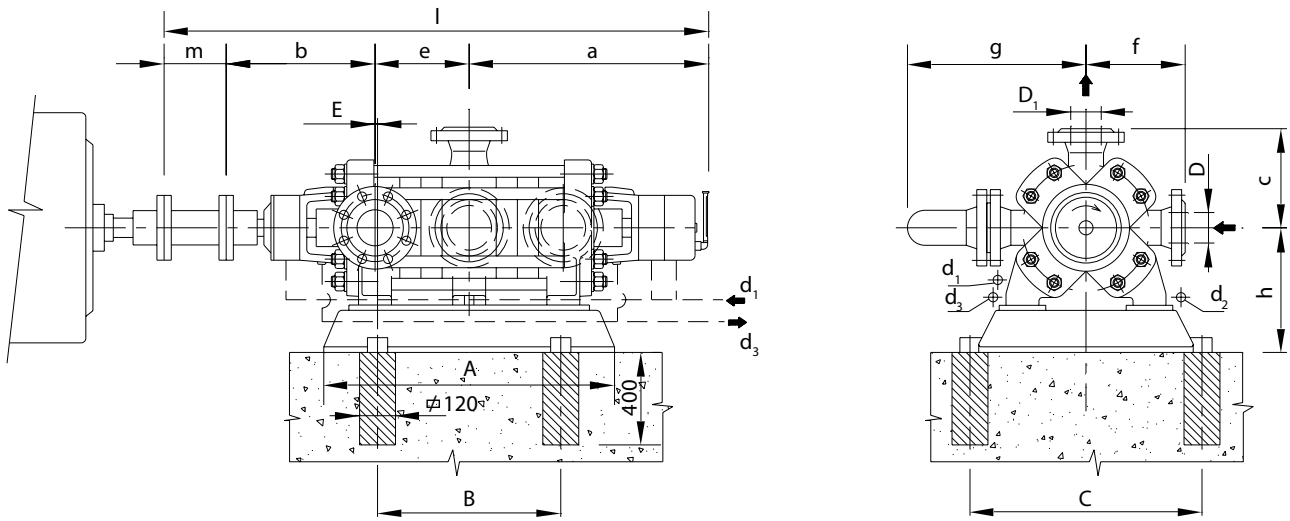
# TECHNICAL DATA

Pump model			80-CES-200-12	100-CES-230-14	125-CES-265-16
Number of stages (in even numbers) from – to			4–14	4–14	4–10
Branches	suction	DN (mm) PN of flanges max. working pressure (MPa)	100 25 1,6	125 25 1,6	150 25 1,6
	discharge	DN (mm) PN of flanges max. working pressure (MPa)	80 100 9	100 100 10	125 100 10
Speed of rotation n (min <sup>-1</sup> )			2950		
Bearing cooling		Water consumption (l.s <sup>-1</sup> ) Water pressure	0,33 0,2–0,3	0,4 0,2–0,3	0,5 0,2–0,3
Moment of inertia*) I (kgm <sup>2</sup> )	number of stages	4	0,144	0,206	0,442
		6	0,169	0,251	0,497
		8	0,194	0,296	0,552
		10	0,219	0,412	0,765
		12	0,244	0,457	–
		14	0,269	0,502	–
Weight **) m (kg)	number of stages	4	628 (538)	730 (640)	990 (853)
		6	711 (603)	855 (732)	1175 (1008)
		8	794 (668)	1010 (824)	1365 (1163)
		10	900 (733)	1125 (916)	1530 (1318)
		12	1006 (790)	1220 (1008)	–
		14	1112 (863)	1400 (1100)	–

\*) Value „I“ has been specified for a pump with a complete coupling and a spacer

\*\*) There are two weights having been specified: the first, it is for a pump with a bed plate, complete coupling and a spacer; the another (in brackets)

# DIMENSIONS



Pump model	Number of stages	a	b	c	e	f	g	h	l	m	D	D <sub>1</sub>	A	B	C	E	
80-CES	4	673	424	285	223	285	525	380	1320	200	100	80	660	400	570	23	
	6	738			288				1450				830	500		38	
	8	803			353				1580				1030	650		103	
	10	868			418				1710				1280	900		17	
	12	933			483				1840				1280	900		700	98
	14	998			548				1970				1280	900		700	98
100-CES	4	727	431	330	257	330	610	415	1415	200	125	100	660	400	700	57	
	6	801			331				1563				830	500		81	
	8	875			405				1711				1030	650		80	
	10	949			479				1859				1280	900		29	
	12	1023			553				2007				1280	900		103	
	14	1097			627				2155				1630	1200		870	27
125-CES	4	802	487	380	292	380	710	460	1581	200	150	125	830	500	700	42	
	6	887			377				1751				1030	650		52	
	8	972			462				1921				1280	900		12	
	10	1057			547				2091				1280	900		97	

Connecting dimensions of the suction branch „D“ flange are intended for PN 25, modification of sealing area – groove.

Connecting dimensions of the discharge branch „D “ flange are intended for PN 100, modification of sealing area – groove

**D<sub>1</sub>** main connection for clean cooling water supply for bearing cooling; it consists of pipe union DN 3/4

**D<sub>2</sub>** main connection for water drain from cooling of bearing; it consists of pipe union DN 1

**D<sub>3</sub>** connection for drain from seals; it consists of pipe union DN 3/4

*Pre-sized but not given dimensions there are changeable in dependence on an electric motor type and size. Binding dimensioned drawing may be worked out on the customer request after thorough technical clarification of contract.*



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