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**Pump  
Protection  
Unit**

**Series TD**  
type TDL  
type TDM



**Automatic recirculation  
valve for minimum flow  
recirculation as pump  
protection**

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**Flow sensitive, self-acting  
3-way control valve**

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**SCHROEDAHL**

Specialty Valves

## Preamble

Schroedahl is the largest supplier of Automatic Recirculation Valves in the world. These ARV's, or Pump Protection System, are our principal product. During the last 30 years we have supplied more than 35,000 of these valves to satisfied customers all over the world.

## Application

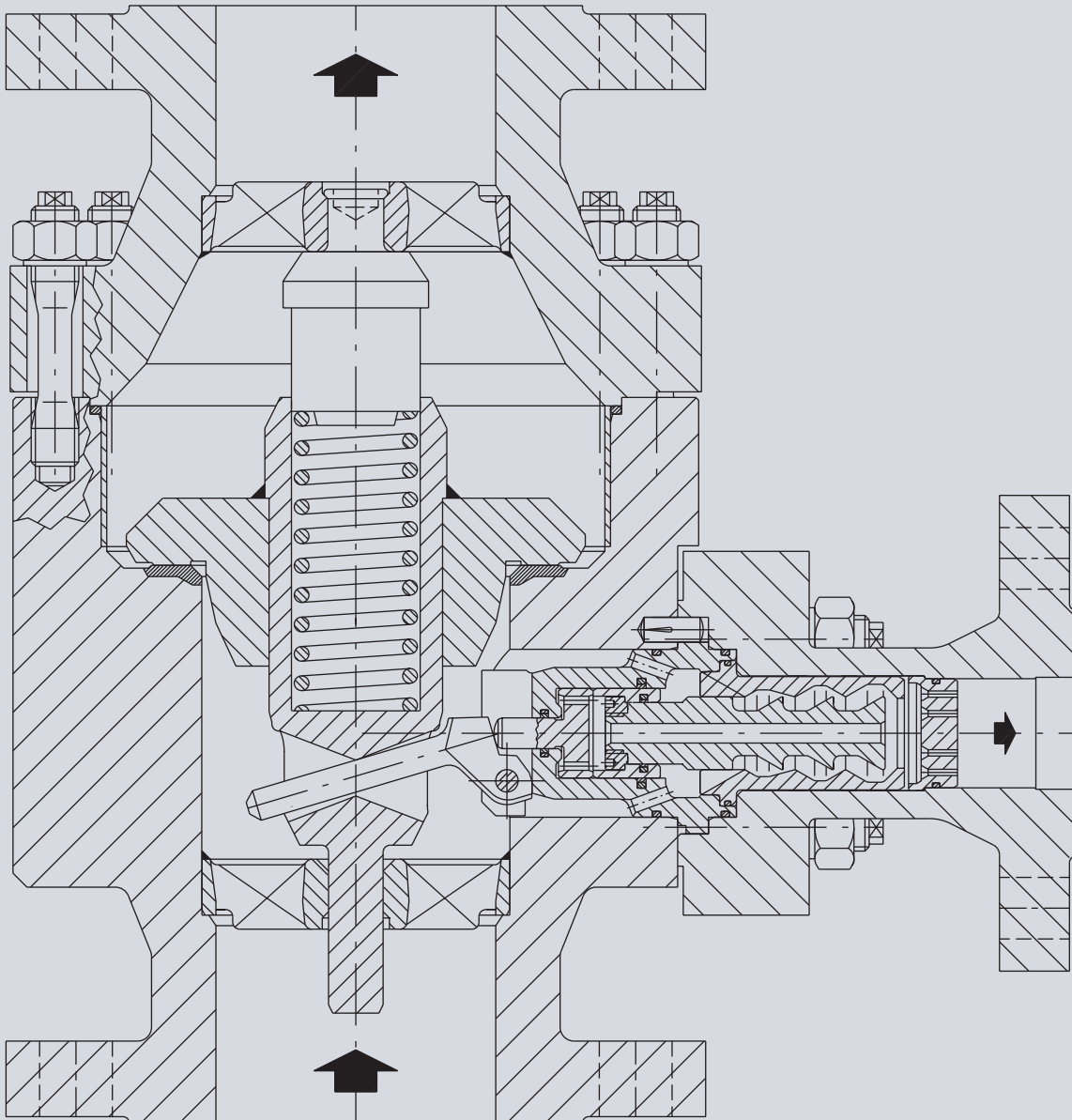
Automatic recirculation valves protect centrifugal pumps against overheating, excessive noise, instability and cavitation during low flow conditions.

If the flow through the pump falls below a certain level the bypass system opens and the fluid will be recirculated providing the required minimum flow through the pump.

## Operation

The main flow positions the check valve at a certain point. The stem of the check valve transmits the motion via a lever to the bypass. The bypass system controls the bypass flow in a modulating way and reduces the pressure to bypass outlet level. The full minimum flow is bypassed when the check valve is seated. The bypass is fully closed when the check valve is in its upper position, thereby allowing full pump flow to the system.

Fig. 1: Drawing of an automatic recirculation valve type TDM



## Operation of the automatic recirculation valves

### Flow sensitive

The checkvalve moves upwards with increasing main flow and downwards with decreasing flow. The checkvalve transmits this motion via a lever to the bypass system (Fig. 3 and 4).

### Type TDL

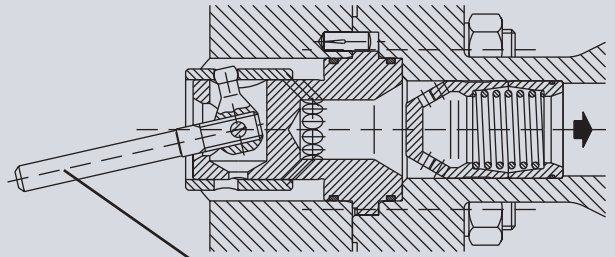
The TDL consists of the check valve section (Fig. 2) with bypass configuration type L (Fig. 3). The lever controls the position of the bushing, which in turn opens more or less the holes in the control head. The minimum flow is thereby bypassed in a modulating way. Applicable for differential pressures up to 40 bar. Standard with non-return function.

### Type TDM

The TDM consists of the check valve section (Fig. 2) with bypass configuration type M (Fig. 4). The movement of the lever is transmitted via a piston to the multi-stages vortex plug. The minimum flow is thereby bypassed in a modulating way over several pressure reduction stages.

Applicable for differential pressures from 40 up to 250 bar. Standard with non-return function.

Fig. 3: Bypass L



Lever

Fig. 4: Bypass M

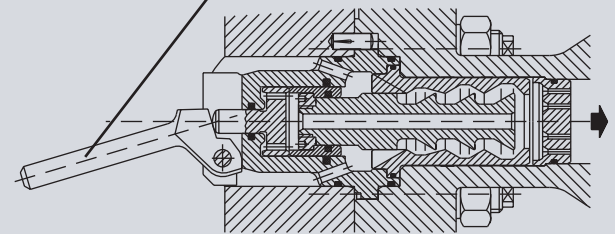
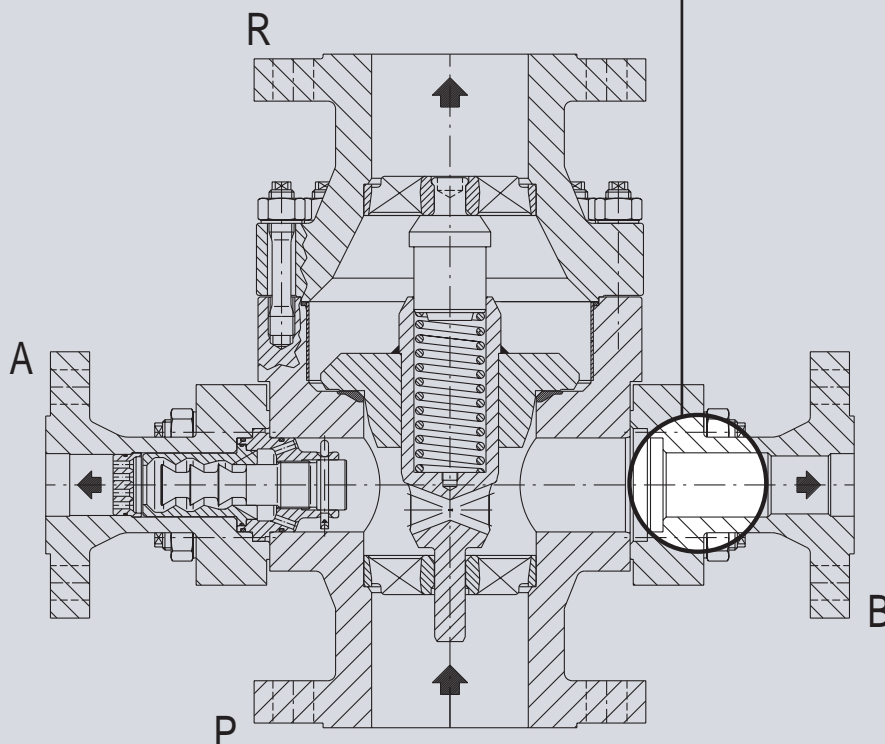


Fig. 2



**P = Pump outlet**  
**R = Pipeline/Process**  
**B = Bypass connection**  
**A = Start-up Connection**  
**(if requested)**

## Valve sizes

Standard size from DN 25 (1") up to DN 300 (12").

## Pressure rating

Pressure rating ranges from PN 10 up to PN 400 (150 lbs to 2500 lbs). Other ratings upon request.

## Connections

Flanges are as a standard according DIN or ANSI, Flanges according to other standards (ISO, BS, JIS, NF) are available upon request.

The inlet and outlet connections can also be supplied with welding ends.

The bypass connection is always flanged (for inspection purposes).

Manual start up upon request.

Draining or warm up connection are available.

## Materials

Standard housing materials:  
W.-Nr. 1.0460 (C22.8) ASTM A105  
W.-Nr. 1.4404 (X2CrNiMo17132) ASTM 316L

The standard internals of the TD valves are of stainless steel with a minimum chrome content of 13%. Other forged materials for housing and internals available upon request.

Selection of the seal material is done according to medium and temperature condition.

The housing material is selected according to medium pressure and temperature condition.

Size - Code	Pressure class-Code	Connection-Code	Configuration-Code
DN 25 (1") = 05	PN 10 = 1	F = Flanges acc. DIN	V = Vertical installation
DN 32 (1 1/4") = 06	PN 16 = 2	U = Flanges acc. ANSI	H = Horizontal installation
DN 40 (1 1/2") = 07	PN 25 (150 lbs) = 3	S = Welding ends	A = Manual start-up
DN 50 (2") = 08	PN 40 = 4		W = Oversized bypass or start-up connection
DN 65 (2 1/2") = 09	PN 63 (300 lbs) = 5		
DN 80 (3") = 10	PN 100 (600 lbs) = 6		
DN 100 (4") = 11	PN 160 (900 lbs) = 7		
DN 125 (5") = 12	PN 250 (1500 lbs) = 8		CS = Carbon Steel
DN 150 (6") = 13	PN 320 = 9		(DIN 1.0460) ASTM A105
DN 200 (8") = 15	PN 400 (2500 lbs) = 0		SS = Stainless Steel
DN 250 (10") = 16			(DIN 1.4404) ASTM 316L
DN 300 (12") = 17			

## Example:

TDM116FVW-CS: Valve type TDM; DN 100, PN 100, DIN-Flanges, Vertical installation, housing material in Carbon Steel

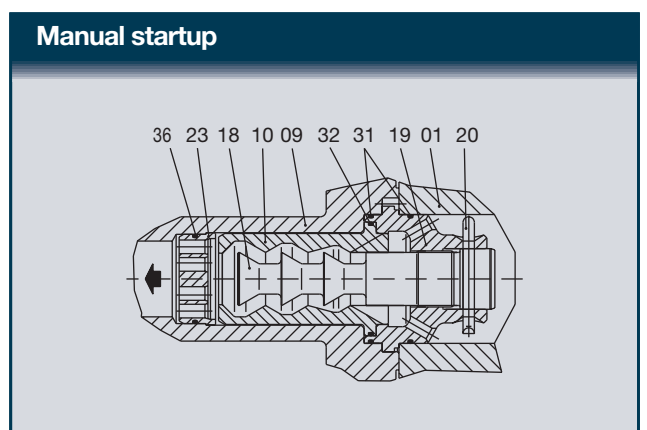
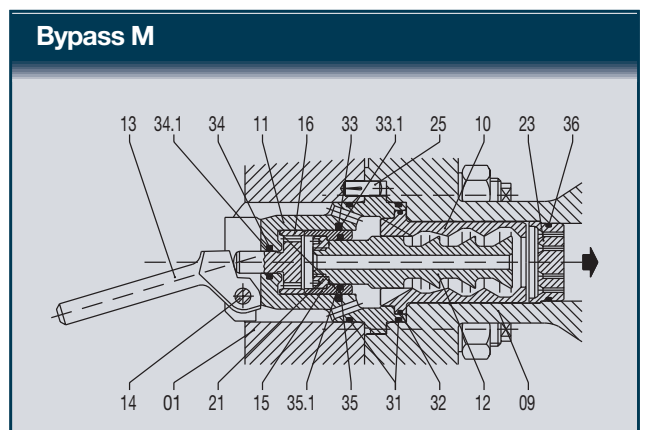
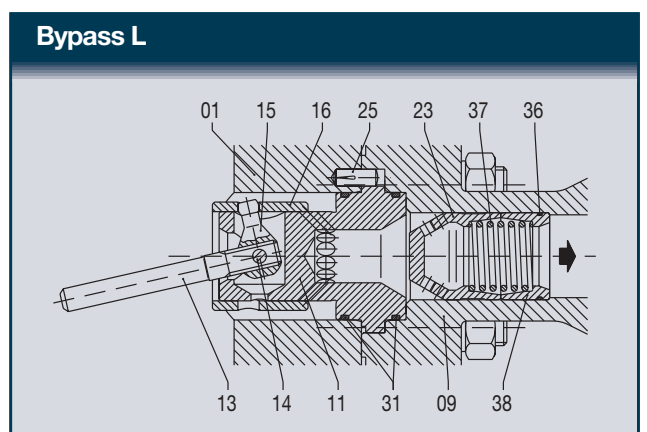
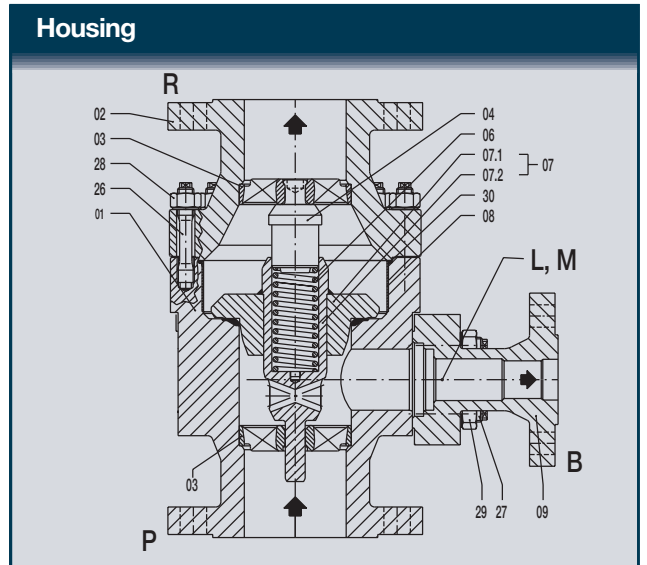
## Parts list

Housing assembly	
Pos.	Description
01	Lower body
02	Upper body
03	Stemguide
04	Guide bolt
06	Spring
07	Check valve assembly
07.1	Check valve
07.2	Stem
08	Liner or Venturi-Ring
09	Bypass branch
25	Guide pin
26	Bolt
27	Bolt
28	Hexagon nut
29	Hexagon nut
30	O-Ring

Bypass L	
Pos.	Description
11	Control head
13	Lever
14	Pivot pin
15	Crank arm
16	Control bushing
23	Orifice bushing
31	O-Ring
36	O-Ring
37	Spring ring
38	Bottom ring

Bypass M	
Pos.	Bezeichnung
10	Vortex bushing
11	Control head
12	Vortex plug
13	Lever
14	Pivot pin
15	Relief bushing
16	Relief piston
21	Threaded ring
23	Bypass orifice
31	O-Ring
32	O-Ring
33	O-Ring
33.1	Glyd-Ring
34	O-Ring
34.1	Glyd-Ring
35	O-Ring
35.1	Glyd-Ring
36	O-Ring

Manual start-up	
Pos.	Description
10	Vortex bushing
18	Vortex plug
19	Holder
20	Pin
23	Orifice plate
31	O-Ring
32	O-Ring
36	O-Ring



## Sizing and selection

Nominal size and pressure class of the automatic recirculation valve should be selected preferably the same as the outlet of the pump.

## Notes:

The following table is only to be used as an indication. Other bypass sizes available upon request. Maximum achievable bypass flow depends on maximum Kv.

For final valve selection please contact our office.

<b>Size-Code</b> .....	05	06	07	08	09	10	11	12	13	15	16	17	
<b>DN P, R (mm)</b> .....	25	32	40	50	65	80	100	125	150	200	250	300	
<b>DN P, R (Zoll)</b> .....	1	1¼	1½	2	2½	3	4	5	6	8	10	12	
<b>Main flow P-R for TDL und TDM valves (m³/h) ..</b>	17	28	45	68	114	178	270	400	530	880	1380	2000	
<b>Bypass L</b> see Fig. 3	<b>DN (mm)</b> .....	25	25	25	25	40	40	50	50	65	80	100	125
	<b>DN (Zoll)</b> .....	1	1	1	1	1½	1½	2	2	2½	3	4	5
	<b>Max. bypass flow P-B (m³/h)</b>	6	10	18	18	40	40	65	65	116	178	270	400
<b>Bypass M</b> see Fig. 4	<b>DN (mm)</b> .....	25	25	25	25	40	40	50	50	65	80	100	125
	<b>DN (Zoll)</b> .....	1	1	1	1	1½	1½	2	2	2½	3	4	5
	<b>Max. bypass flow P-B (m³/h)</b>	6	10	18	18	40	40	65	65	116	178	270	400

## Installation:

The automatic recirculation valve should be installed as close as possible to the centrifugal pump, preferably directly on the outlet of the pump.

To prevent low frequency shocks caused by pulsation of the medium, the distance between pump outlet and valve inlet should not exceed 1.5 m.

Vertical installation is preferred, but horizontal installation is also possible.

## Maintenance:

Maintenance and installation instructions are available upon request.

Correct operation of the valve is to be checked with the usual operational test of the pump.



## Automatic Recirculation Valve Technical Data

Customer:

Enquiry no.:

Datasheet:

Prior reference:

Order no.:

Quantity:

Project:

Automatic Recirculation Valve type:

Valve inlet	DN	PN	Acc.:
Valve outlet	DN	PN	Installation: vertical / horizontal
Bypass outlet	DN	PN	Paint:
Start-up	DN	PN	Start-up <input type="checkbox"/> above/ <input type="checkbox"/> below checkvalve:

Mat.-/test certificates:

Materials

Housing	Internals	Seals
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Medium

Operating temp.: °C

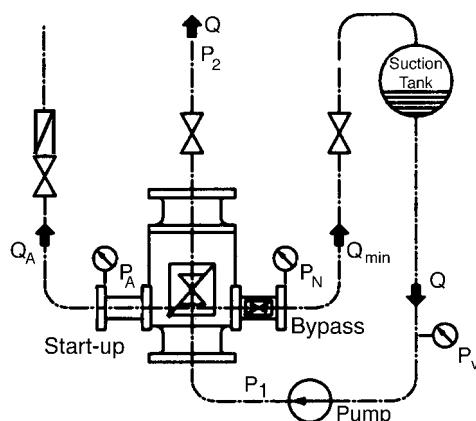
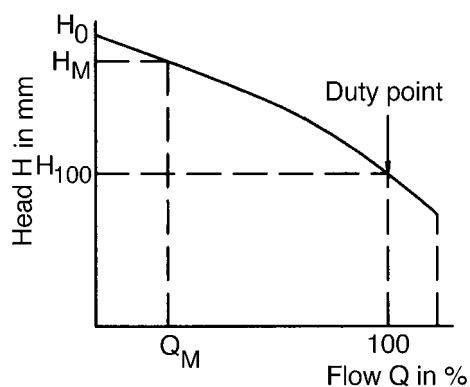
S.G.: [t/m<sup>3</sup>]

Design temp.: °C

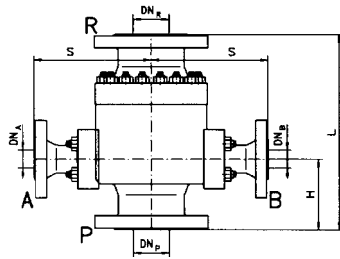
	$H_0 =$	m		
$Q_M =$	m <sup>3</sup> /h	$H_M =$	m	Suction pr. $p_v$ bar
$Q_{100} =$	m <sup>3</sup> /h	$H_{100} =$	m	Differential pr. ( $p_1 - p_N$ ) bar
$Q_{max} =$	m <sup>3</sup> /h	$H_{Q_{max}} =$	m	Backpress $p_N$ bar
$Q_A =$	m <sup>3</sup> /h	$H_A =$	m	Backpress $p_A$ bar

Notes:

Revision	Date	Description	Name	Signature



P = Pump outlet  
 R = Pipeline/Process  
 B = bypass connection  
 A = Start-up connection



### Dimensions DIN

Size	DN <sub>R</sub> /DN <sub>P</sub>	PN (bar)	DN <sub>B</sub>	L (mm)	S (mm)	H (mm)	Weight (kg)
051-052-053-054	25	10-16-25-40	25	190	153	73	17
055		63		250	182	90	32
056		100		250	182	90	32
061-062-063-064	32	10-16-25-40	25	190	153	73	19
065		63		250	182	90	32
066		100		250	182	90	32
071-072-073-074	40	10-16-25-40	25	200	155	75	19
075-076-077		63-100-160		260	190	90	32
078		100		300	215	120	43
081-082-083-084	50	10-16-25-40	25	230	163	90	27
085		63		300	185	115	41
086-087		100-160		300	193	110	48
088		250		350	223	130	59
091-092-093-094	65	10-16-25-40	40	290	184	110	42
095		63		340	219	125	60
096-097		100-160		340	227	125	69
098		250		400	260	145	89
101-102-103-104	80	10-16-25-40	40	310	191	115	52
105		63		380	233	140	74
106-107		100-160		380	240	140	84
108		250		450	265	165	122
111-112-113-114	100	10-16-25-40	50	350	221	125	81
115		63		430	258	155	112
116-117		100-160		430	266	155	126
118		250		520	300	190	106
121-122-123-124	125	10-16-25-40	50	400	266	135	122
125		63		500	280	175	182
126-127		100-160		500	291	175	207
128		250		600	321	215	200
131-132-133-134	150	10-16-25-40	65	480	295	165	138
135		63		550	350	190	273
136		100		550	355	190	289
137		160		585	355	200	289
138		250		700	405	250	444
151-152-153-154	200	10-16-25-40	80	600	395	200	241
155		63		650	405	215	467
156-157		100-160		680	430	225	501
158		250		830	485	290	785
161-162-163-164	250	10-16-25-40	100	730	475	240	411
165		63		775	520	260	714
166-167		100-160		800	560	270	857
168		250		900	560	310	1284
171-172-173-174	300	10-16-25-40	125	850	530	280	740
175		63		900	550	300	930
176-177		100-160		1050	650	360	1485
178		250		1200	720	420	2100

### Dimensions ANSI

Size	DN <sub>R</sub> /DN <sub>P</sub>	PN (bar)	DN <sub>B</sub>	L (mm)	S (mm)	H (mm)	Weight (kg)
073	1 1/2"	150	1"	200	155	75	17
075		300		260	190	90	32
076		600		260	190	90	32
077		900		300	200	110	32
078		1500		310	215	120	43
083	2"	150	1"	230	163	90	23
085		300		300	185	115	41
086		600		300	193	110	48
087		900		340	203	130	48
088		1500		350	233	130	59
093	2 1/2"	150	1 1/2"	290	174	110	35
095		300		340	199	125	80
096		600		340	220	125	89
097		900		380	230	140	69
098		1500		400	250	145	80
103	3"	150	1 1/2"	310	191	115	44
105		300		380	220	140	74
106		600		380	240	140	84
107		900		410	250	150	84
108		1500		450	275	165	122
113	4"	150	2"	350	211	125	81
115		300		430	240	155	112
116		600		430	266	155	126
117		900		450	280	160	126
118		1500		520	300	190	186
123	5"	150	2"	400	266	135	82
125		300		500	290	175	182
126		600		500	300	175	207
127		900		525	310	185	207
128		1500		650	341	235	280
133	6"	150	2 1/2"	480	295	165	138
135		300		550	350	190	273
136		600		550	355	190	288
137		900		585	355	200	269
138		1500		700	405	250	444
153	8"	150	3"	600	395	200	241
155		300		650	405	215	467
156		600		680	430	225	501
157		900		700	430	225	501
158		1500		880	485	310	786
163	10"	150	4"	730	475	240	411
165		300		775	520	260	714
166		600		800	560	270	824
167		900		800	560	270	857
168		1500		980	570	340	1284
173	12"	150	5"	850	530	280	740
175		300		900	550	300	930
176		600		1050	650	360	1425
177		900		1050	650	360	1485
178		1500		1250	720	440	2100

Subject to technical changes without notice.

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