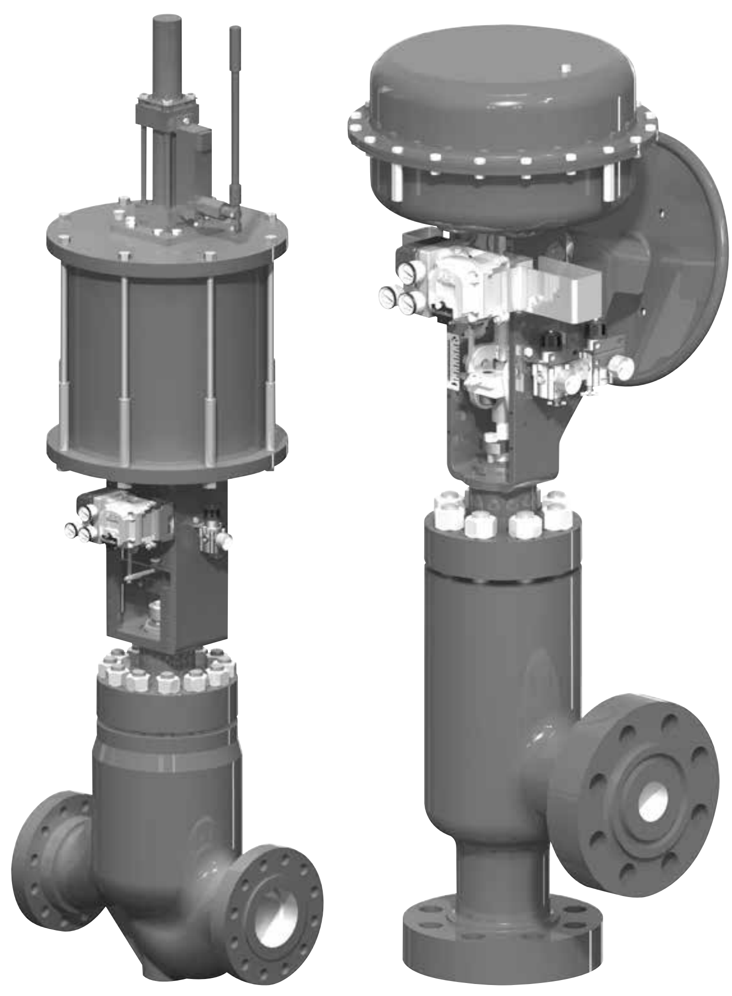
GE Oil & Gas

78400/18400 Series

Masoneilan* LincolnLog*
High Pressure Anti-Cavitation Control Valves



imagination at work

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Features

The Masoneilan LincolnLog is the premier high-pressure liquid letdown valve in the process control industry. It is a field proven severe service solution for cavitating and erosive applications in various industries. The LincolnLog is uniquely designed to operate reliably in harsh environments and dirty liquids. Key design features of the LincolnLog include:

Cavitation Elimination

The multi-step flow path created by the LincolnLog trim design, reduces the pressure drop in multiple stages without allowing the local pressure to drop below the fluid vapor pressure thus preventing cavitation. These active stages throttle in unison to avoid taking the full pressure drop across any individual stage.

Dirt Tolerant

Wide flow paths in the LincolnLog allow free passage of large particles through the unique trim and body design without causing any damage or loss of capacity. This ensures continuous and efficient operation by eliminating concerns of potential clogging due to entrained particles.

The LincolnLog is a proven problem solver in dirty service applications.

Heavy Plug Guiding

Guiding is provided along the full length of the plug by a hardened liner, which minimizes any vibration effects and results in excellent dynamic stability. This helps to improve product yield through accurate and smooth process control.

Versatile Trim Options

Standard LincolnLog trim is available in 3, 4 and 6 stages with different staging ratios to cover the vast majority of high-pressure liquid letdown services.

Masoneilan can also provide engineered solutions consisting of additional stages to satisfy specific application requirements. The LincolnLog is available with both balanced and unbalanced plug designs for greater application flexibility.

Protected Seat Design

Overlap is designed into the trim at low lift to keep high velocity flow away from the valve seat. This helps to avoid seat erosion and extends the operating life under high pressure drop conditions.

Reliable Tight Shutoff

Standard seat leakage rating for the LincolnLog meets IEC 534-4 and ANSI/FCI 70.2 Class V shutoff. An optional soft seat design provides Class VI bubble tight shutoff. It includes a patented sliding metal collar design, which protects the soft seat from extruding and serves as a back-up seating surface. The LincolnLog can also be supplied with block valve tight shutoff per MSS-SP-61.

Ease of Maintenance

LincolnLog's simple top-entry design includes quick change trim for easy access and removal. The integral liner and seat ring also reduces the number of components and simplifies assembly and disassembly.

NACE and PED Compliance

The LincolnLog is available for Sour Service Applications using the design and construction methods defined in NACE Standard MR0103. Product configurations for applications requiring compliance to MR0175 - 2003 or ISO 15156 are also available upon request. The LincolnLog is also designed for compliance with Pressure Equipment Directives (PED) requirements.

General Data

- Flow Direction
  - Standard: Flow-to-open

- Body
  - Type: cast or forged globe style
    cast or forged angle style
  - Sizes: 1” to 8” (DN 25 to DN 200)
  - Ratings: ANSI Class 600 to 2500
    (ISO PN 100 to 420)
    API 5000 to 10000
  - End connections: RFF, RTJ, socket weld,
    butt weld, threaded
    print flanges (forgings)
- Bonnet
  - Type: Bolted
    Standard
    Extension
- Body and Bonnet
  - Materials: carbon steel
    316 stainless steel
    chrome-moly
    others

- Trim
  - Plug type: multi-step axial flow
    (3, 4 and 6 stages)
  - Seat type: quick change
    integral with plug liner (1” & 1.5” sizes)
    metal seat
    soft seat
  - Guide: heavy top guided (liner)
  - CV ratio: see Flow Capacity tables (page 7)
  - Flow characteristics: Modified linear
    (see page 8)
- Actuator
  - Type: Spring-diaphragm
    Spring-return cylinder
    Double-acting cylinder
  - Handwheel: Optional

Optional designs are also available, such as larger sizes, higher pressure ratings, special materials, or additional trim stages as required. Consult factory for design details and specifications.

Numbering System

1st	2nd	–	1st	2nd	3rd	4th	5th	6th
				8	4			

Actuator Type

- 20 Top Mounted Manual Handwheel
- 87 Spring-Diaphragm Air to Close
- 88 Spring-Diaphragm Air to Open
- 84 Cylinder: Spring Return, Direct, Air to Close, Single or Double Acting (Fail Open Action
- 85 Cylinder: Spring Return, Reverse Air to Open, Single or Double Acting (Fail to Close)
- 86 Cylinder: Double Acting, Without Springs, Air to Open or Air to Close Action

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Body Series

- 1 Globe
- 7 Angle

Trim Type

- 4 Axial Flow High Resistance (Downseating)

No. of Stages*

- 3 Three
- 4 Four
- 6 Six

Trim Size

- 0 Optional Trim
- 1 Trim A, Balanced Hard Seat
- 2 Trim B, Balanced Hard Seat
- 3 Trim C, Balanced Hard Seat
- 4 Trim A, Balanced Soft Seat
- 5 Trim B, Balanced Soft Seat
- 6 Trim C, Balanced Soft Seat
- 7 Trim A, Unbalanced Hard Seat
- 8 Trim B, Unbalanced Hard Seat
- 9 Trim C, Unbalanced Hard Seat

Optional Configuration

- F Forged Body Design
- EB Extension Bonnet

*Additional stages are available to meet specific operating conditions. Please consult Masoneilan.

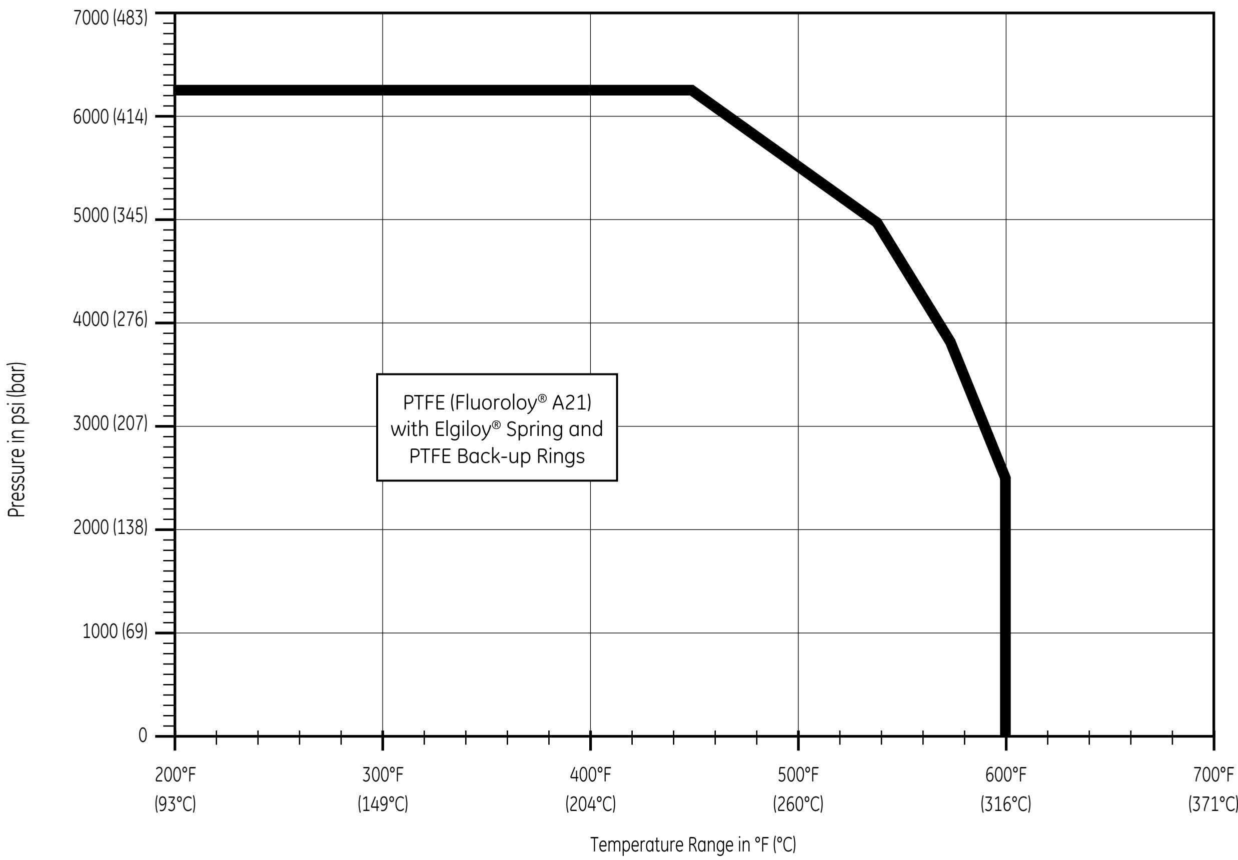
Temperature Range / Seat Leakage

Valve Sizes		Trim Type	Seat Type	Temperature Range (1)		Seat Leakage Class (2)
inches	DN			min.	max.(4)	
1	25	Unbalanced	Metal Seat	-20°F (-29°C)	600°F (316°C)	V (See Note 3)
1.5 to 8	40 to 200	Balanced	Metal Seat	-20°F (-29°C)	600°F (316°C)	
		Unbalanced	Metal Seat	-20°F (-29°C)	600°F (316°C)	
2 to 8	50 to 200	Balanced or Unbalanced	Soft Seat	-20°F (-29°C)	450°F (232°C)	VI

1. Designs for higher or lower temperatures are available. Please consult Masoneilan.
2. Seat leakage class ratings per IEC 534-4 and ANSI/FCI 70.2. Class V seat leakage is standard and Class VI is optional.
3. Optional block valve tight shutoff per MSS-SP-61 also available.
4. Max. temp. limit of 600°F (316°C) with unbalanced trim requires use of optional flexible graphite packing or an extension bonnet.

Balance Seal Pressure and Temperature Limits

LincolnLog 78400/18400 Balance Seal Pressure-Temperature Application Range



Ratings/Connections

❑ RF Flanged ● Socket Weld ❍ Threaded ∆ RT Joint ■ Butt Weld

Valve Size (1)		Pressure Class (2)			
inches	DN	600	900	1500	2500
1 & 1.5	25 & 40	❑●❍∆■	❑●❍∆■	❑●❍∆■	❑●❍∆■
2	50	❑●❍∆■	❑●❍∆■	❑●❍∆■	❑●❍∆■
3	80	❑∆■	❑∆■	❑∆■	❑∆■
4	100	❑∆■	❑∆■	❑∆■	❑∆■
6	150	❑∆■	❑∆■	❑∆■	❑∆■
8	200	❑∆■	❑∆■	❑∆■	❑∆■

1) Sizes, ratings and end connections are available in both globe and angle body styles.
2) Pressure classes shown represent ASME/ANSI ratings and equivalent PN ratings.

Flow Capacity and F_L

Satandard Capacity — 3-Stage Design | Flow Characteristic: MODIFIED LINEAR

Valve Size		Orifice Diameter		Travel		Trim C		Min, Cont. C_V
Inches	DN	Inches	mm	Inches	mm	CV	F_L	
1	25	.70	17.8	.25	6.35	2.0	.98	.05
1.5	40	1.00	25.4	.25	6.35	3.8	.98	.10
2	50	1.50	38.1	.38	9.65	9.0	.98	.15
3	80	2.25	57.2	.62	15.7	20	.98	.25
4	100	2.88	73.2	.75	19.1	34	.98	.43
6	150	4.12	105	1.00	25.4	65	.98	.56
8	200	5.38	137	1.25	31.8	135	.98	1.0

Satandard Capacity — 4-Stage Design | Flow Characteristic: MODIFIED LINEAR

Valve Size		Orifice Diameter		Travel		Trim A		Trim B		Trim C		Min, Cont. C_V
Inches	DN	Inches	mm	Inches	mm	C_V	F_L	C_V	F_L	C_V	F_L	
1	25	.70	17.8	.25	6.35	1.0	.996	1.4	.994	1.7	.991	.04
1.5	40	1.00	25.4	.25	6.35	1.9	.996	2.5	.994	3.2	.991	.08
2	50	1.50	38.1	.38	9.65	4.5	.996	6.0	.994	7.5	.991	.12
3	80	2.25	57.2	.62	15.7	10	.996	13	.994	16.5	.991	.20
4	100	2.88	73.2	.75	19.1	16.5	.996	22	.994	28	.991	.35
6	150	4.12	105	1.00	25.4	34	.996	45	.449	56	.991	.46
8	200	5.38	137	1.25	31.8	70	.996	90	.994	115	.991	.80

Satandard Capacity — 6-Stage Design | Flow Characteristic: MODIFIED LINEAR

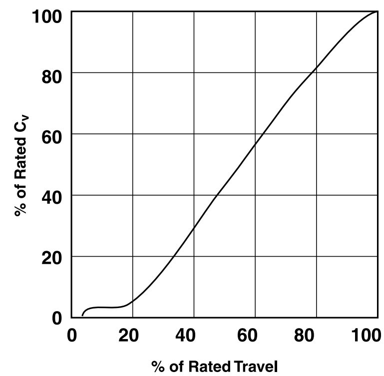
Valve Size		Orifice Diameter		Travel		Trim A		Trim B		Trim C		Min, Cont. C_V
Inches	DN	Inches	mm	Inches	mm	C_V	F_L	C_V	F_L	C_V	F_L	
1	25	.70	17.8	.25	6.35	.80	.996	1.0	.994	1.4	.991	.03
1.5	40	1.00	25.4	.25	6.35	1.4	.996	1.8	.994	2.5	.991	.05
2	50	1.50	38.1	.38	9.65	3.5	.996	4.5	.994	6.0	.991	.08
3	80	2.25	57.2	.62	15.7	7.5	.996	9.5	.994	13	.991	.13
4	100	2.88	73.2	.75	19.1	12	.996	16	.994	22	.991	.22
6	150	4.12	105	1.00	25.4	25	.996	33	.449	45	.991	.30
8	200	5.38	137	1.25	31.8	50	.996	65	.994	91	.991	.65

Flow Characteristics

The LincolnLog trim provides a smooth modified linear control characteristic with "clearance flow" capacity over the initial 15% of valve travel as shown in the generic chart and table at right.

Incorporation of the multi-stage "clearance flow" design concept prevents high pressure drops across the LincolnLog seating area while throttling at low lifts. This feature helps to extend trim life significantly, resulting in dependable and tight shutoff whenever required. It also improves the throttling control stability and performance at low lifts, while providing smooth, accurate and continuous capacity control from 15% to 100% plug travel. Controllability extends from the Maximum Rated CV to the Minimum Controllable CV for any valve size resulting in typical turndown ratios of 50:1.

LincolnLog C_V vs. Travel



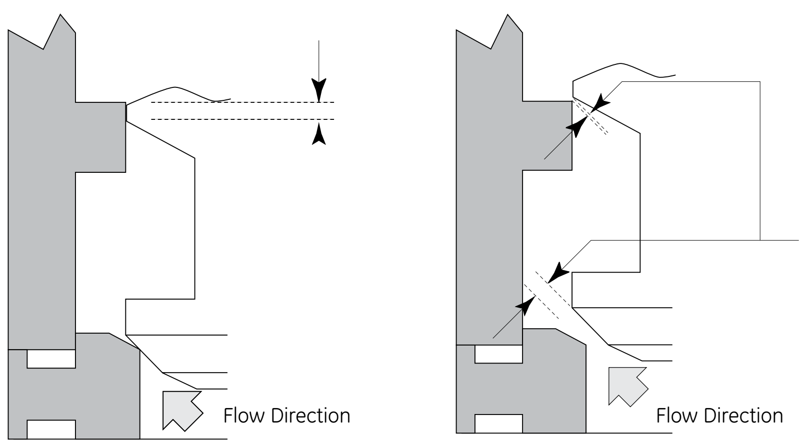
% Max. Opening	5	10	20	30	40	50	60	70	80	90	100
% Max. CV	*	*	3	15	27	39	52	64	76	88	100

* Clearance Flow Only

Trim Seat Protection

The "clearance flow" feature described in the previous section is achieved through the trim overlap design illustrated below:

LincolnLog Trim Overlap Seat Protection Feature



0 - 15% of Plug Travel
Trim overlap with the valve in the closed or low lift positions.

15 - 100% of Plug Travel
There is much greater flow area through the valve seat versus the plug notches. As a result, pressure drop and velocities across the critical seating surfaces are controlled eliminating seat damage.

Valve Sizing Guidelines

General

LincolnLog multi-stage control valves can be sized using either standard IEC/ISA equations or using the latest Masoneilan sizing and selection software program.

Noise Predictions

Valve noise calculations can be performed using the Masoneilan sizing and selection program based on the latest IEC equations. The serial stage construction of the LincolnLog design helps to significantly reduce trim noise. Calculating the noise at the last stage of the LincolnLog trim will closely approximate the overall valve noise produced. Pressure drop across the last stage can be derived from the table below and used in the noise calculations.

Trim Selection

As indicated in the table below, the LincolnLog is available in various standard trim types and number of stages. Each trim style provides different staging ratios and different pressure drop percentages per stage. Recommended limits for ΔP per stage are 800 psi (60 bar) for continuous duty cycle applications and up to 1000 psi (70 bar) ΔP per stage for intermittent service. The recommended operating throttling ΔP limits are also shown in the table below.

Engineered Solutions

For flashing service, the expansion ratio of the fluid will determine the appropriate staging ratio to apply. Non-standard staging ratios can be supplied for compressible two-phase flow or flashing conditions not covered by the standard trim. Please consult Masoneilan for proper sizing and design of engineered solutions for these types of applications.

Staging Ratios & Pressure Drop Guidelines

Trim Type	No. of Stages	Staging Ratios (1x2)	Pressure Drop per Stage(3)		Maximum Recommended Throttling ΔP			
					Continuous Service		Intermittent Service	
			Stages	Fraction of Total ΔP	psi	bar	psi	bar
C	3	1-1-2	1 to 2	.44	1595	110	2030	140
			3	.11				
C	4	1-1-1-2	1 to 3	.31	2248	155	2900	200
			4	.08				
B	4	1-1-2-3	1 to 2	.42	1885	130	2320	160
			3	.11				
			4	.05				
A	4	1-1-2-4	1 to 2	.43	1885	130	2320	160
			3	.11				
			4	.03				
C	6	1-1-1-1-1-2	1 to 5	.19	3698	255	4713	325
			6	.05				
B	6	1-1-1-1-2-3	1 to 4	.23	3480	240	4350	300
			5	.06				
			6	.025				
A	6	1-1-1-1-2-4	1 to 4	.23	3408	235	4278	295
			5	.06				
			6	.014				

(1) Staging ratios provide approximations of the relative area ratios for each specific trim type. As an example, a staging ratio of 1-1-2 indicates that the final stage for that trim type has approximately twice the area of the first two stages.
(2) Staging ratios do not have any relative correlation between the different trim types.
(3) Recommended limits for ΔP per stage are 800 psi (60 bar) for continuous duty cycle applications and up to 1000 psi (70 bar) ΔP per stage for intermittent service.

Table 4 - TRI-NADO TM Parts List

Item Number	Quantity Used	Identification
1	2	Headplate
2	1	Cylinder
3	1	Gearbox
5	1	End Cover
7	2	Impeller
8	4	Bearing Clamp Plate
9	2	Gear
12	1	Shaft - Gear End Driven
14	2	Shaft - Opposite Gear End
16	1	Key (coupling)
17	2	Shim Set
18	2	Gasket - Gearbox/End Cover
21	16	Lock Washer (clamp plates)
22	16	Cap Screw - Hex Head (clamp plates)
23	1	Seal - Drive Shaft
27	4	Seal - Inboard
29	2	Lifting Lug
30	76	Cap Screw - Hex Head (covers/plates)
30A	6	Cap Screw - Hex Head (lifting lugs)
31	4	Bearing - Spherical Roller
34	1	Name
35	18	Drive Screw - Round Head (nameplates/arrow)
36	4	Dowel Pin (gearbox alignment)
37	2	Vent Plug
42	54	Cap Screw - Socket Head (impeller)
43	6	Taper Pin (impeller)
44	1	Label - WHISPAIR™
69	6	Pipe Plug (headplate)
70	5	Pipe Plug gearbox/end cover/cylinder)
74	1	Rotation Arrow
87	2	Sight Plug - Oil Level
92	2	Label - Identification
100	4	Dowel Pin - Pull Out (headplate alignment)
101	2	Lock Nut (gears/bearings)
105	1	Shaft - Gear End Drive
109	4	Piston Ring Seal
141	1	Slinger - Opposite Gear End
181	1	Cover Plate - Cylinder
182	12	Cap Screw - Hex Head (cover plate)
184	1	Slinger - Gear End
185	3	Cap Screw - Button Head (slinger)
186	6	Washer (slinger)
188	2	Washer - Wavy Spring
194	4	Anti-rotation Pin
194A	4	Washer
196	4	Cap Screw - Hex Head (slinger)
197	2	Close Nipple (vent plug)
198	2	Pipe Coupling (vent plug)
203	4	Flat Washer (slinger)

Trouble Shooting Checklist

Trouble	Item	Possible Cause	Remedy
No flow	1	Speed too low	Check by tachometer and compare with speed on Roots Order Acknowledgement.
	2	Wrong rotation	Compare actual rotation, change driver rotation if wrong.
	3	Obstruction in piping	Check piping valve, silencer, to assure open flow path.
Low Capacity	4	Speed too slow	See Item 1.
	5	Excessive pressure rise	Check inlet vacuum and discharge pressure and compare these figures with specified operation conditions on order.
	6	Obstruction in piping	
	7	Excessive slip	See Item 3. Check inside of casing for worn or eroded surfaces causing excessive clearances.
Excessive Power	8	Speed too high	See Item 1.
	9	Excessive pressure rise	See Item 5.
	10	Impeller rubbing	Inspect outside of cylinder for high temperature areas, then check for impeller contact at these points. Look for excessive scale build-up. Correct blower mounting drive alignment.
Overheating of bearings or gears	11	Inadequate lubrication	Check oil sump levels in end covers.
	12	Excessive lubrication	Check oil levels. If correct, drain and refill with clean oil or recommended grade
	13	Excessive pressure rise	See Item 5.
	14	Coupling misalignment	Check carefully. Realign if questionable.
Vibration	15	Misalignment	See Item 14.
	16	Impellers rubbing	See Item 10.
	17	Worn bearings/gears	Check gear backlash and condition of bearings and replace as indicated.
	18	Unbalanced or rubbing impellers	Scale or process material may build up on casing and impellers or inside impellers. Remove build-up to restore original clearances and impeller balance.
	19		Tighten mounting bolts accurately.
	20	Driver or blower loose Piping resonance	Determine whether standing wave pressure pulsations are present in the piping. Refer to Sales Office.
Driver stops or will not start	21	Impeller stuck	Check for excessive hot spot on headplate or cylinder. See Item 10. Look for detective shaft, bearing and/or gear teeth.
Excessive breather blowby or excessive oil leakage to vent area	22	Broken seal	Replace seals

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