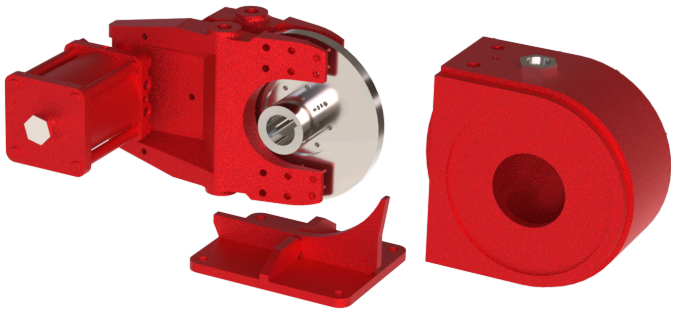


Product Catalogue

Systems, Discs, Drums & Couplings

Section 04 · 2026 edition

04.01 Air Power Units & Controls
04.02 Hydraulic Power Units & Controls
04.03 Discs, Drums & Couplings
04.04 Custom Brakes
04.05 Engineering Section

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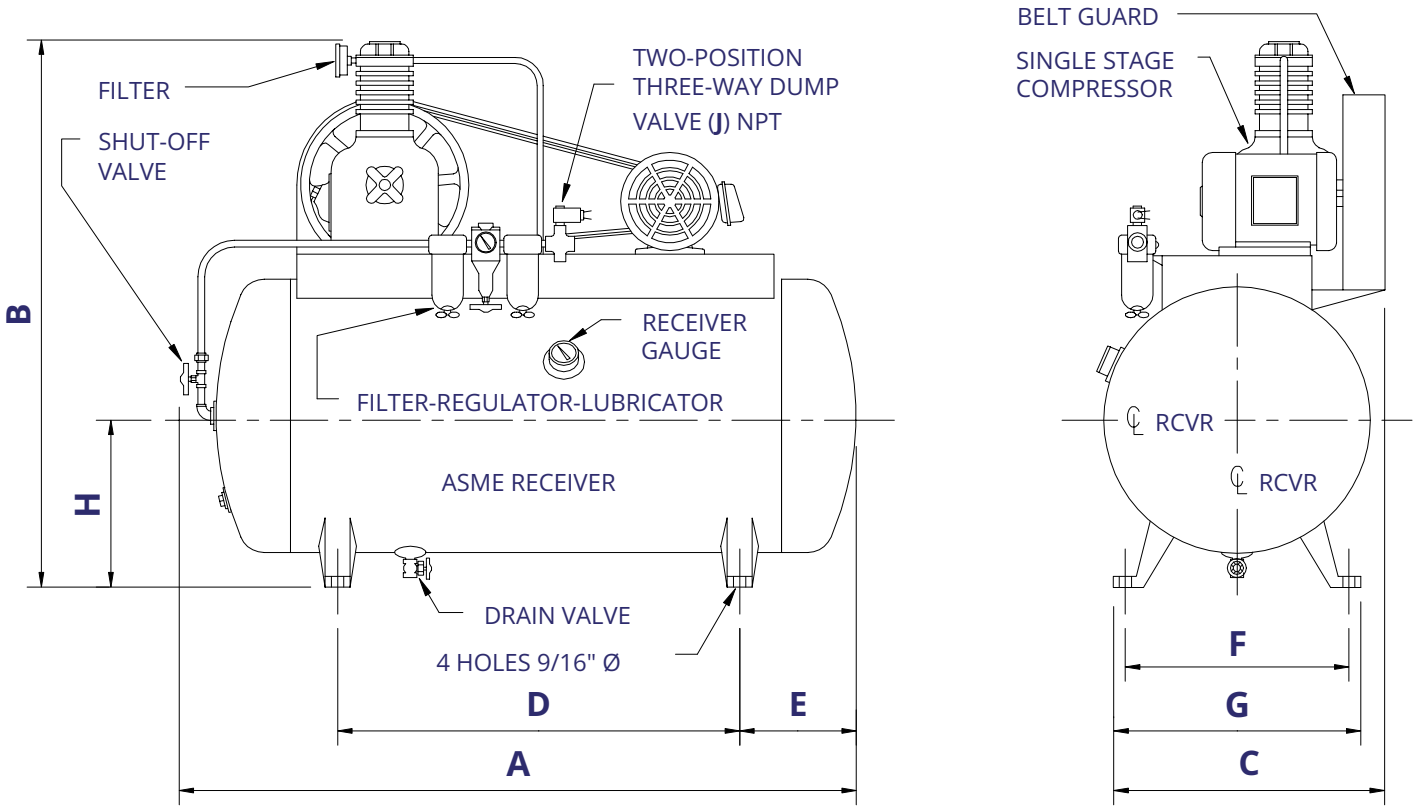
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Johnson Air Power Units

DRAWING
AUHU01-1.0



Specifications

Dual imperial / metric (hp/kw, usg/l, cfm/lpm, psi/kPa, in./mm, lb/kg)

- Single stage compressor with belt guard; ASME receiver
- Filter, shut-off valve, filter-regulator-lubricator, receiver gauge, drain valve
- Two-position three-way dump valve (J) NPT
- 4 mounting holes 9/16 in Ø
- NOTE: the last two rows of the printed table repeat the model codes AD172 and AE280 at higher power ratings (10 HP and 15 HP) — recorded as printed; confirm the correct model codes before use

Model no.	Power hp/kw	Receiver usg/l	Delivered cfm/lpm	Maximum pressure psi/kPa	A	B	C	D	E	F	G	H	J	Weight lb/kg
AA020	0.5 / 0.37	12 / 38	1.98 / 56.1	120 / 830	26/660	27/686	15/381	16/406	6/152	14/356	15.5/394	9/229	0.375/9.5	122 / 55.5
AA030	0.75 / 0.56	20 / 63	2.97 / 84.1	120 / 830	30/762	29/737	16/406	18/457	7/178	14/356	16/406	9/229	0.375/9.5	137 / 62.3
AA037	1 / 0.75	30 / 95	3.95 / 112	120 / 830	42.5/1080	41/1040	17/432	22/559	8/203	14.25/362	16.5/419	11/279	0.375/9.5	320 / 145
AB071	1.5 / 1.12	60 / 190	5.93 / 168	120 / 830	53/1350	45/1140	20/508	28/711	9.25/235	18/457	20/508	13/330	0.5/13	425 / 193
AB100	2 / 1.49	60 / 190	7.91 / 224	120 / 830	53/1350	46/1168	20/508	28/711	9.25/235	18/457	20/508	13/330	0.5/13	435 / 198
AC143	3 / 2.24	80 / 25	11.9 / 337	120 / 830	70/1780	47/1190	22/559	40/1020	13.5/343	18/457	20/508	13/330	0.5/13	665 / 302
AD172	5 / 3.73	80 / 250	19.8 / 561	120 / 830	70/1780	50/1270	22/559	40/1020	13.5/343	18/457	20/508	13/330	0.5/13	770 / 350
AE280	7.5 / 5.59	120 / 380	29.7 / 841	120 / 830	75/1910	55/1400	31/787	40/1020	14/356	22/559	25/635	16/406	0.75/19	920 / 418
AD172 (10 HP row, as printed)	10 / 7.46	120 / 380	39.5 / 1120	120 / 830	75/1910	66/1680	31/787	40/1020	14/356	22/559	25/635	16/406	0.75/19	1050 / 2310
AE280 (15 HP row, as printed)	15 / 11.2	120 / 380	59.3 / 1680	120 / 830	75/1910	67/1700	31/787	40/1020	14/356	22/559	25/635	16/406	0.75/19	1290 / 2840

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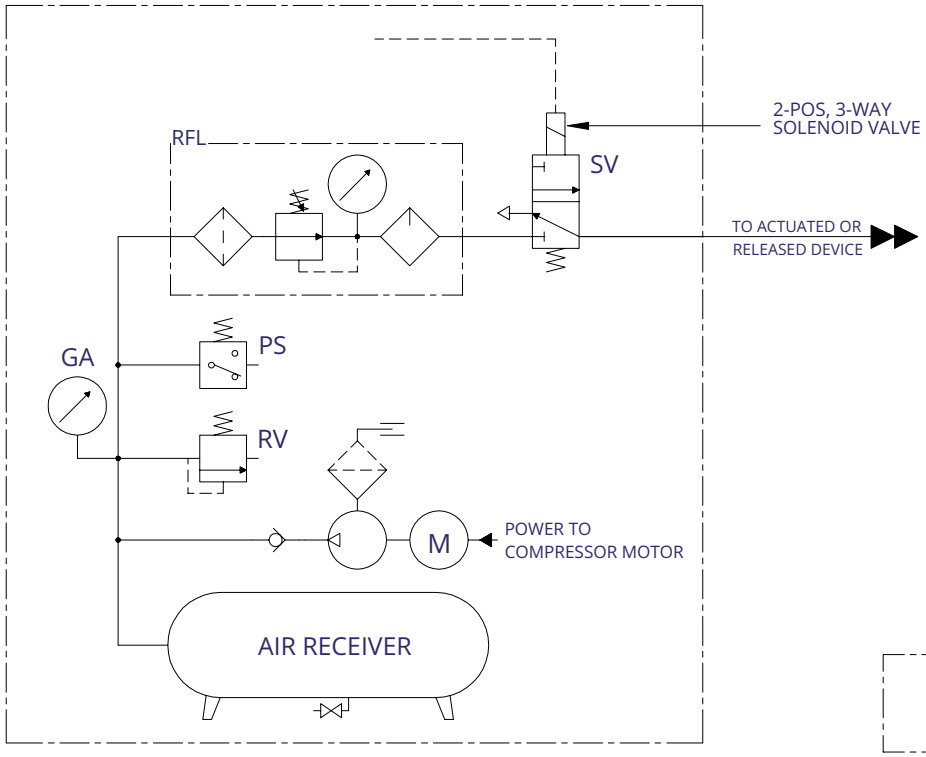
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Typical Air Power Unit Controls

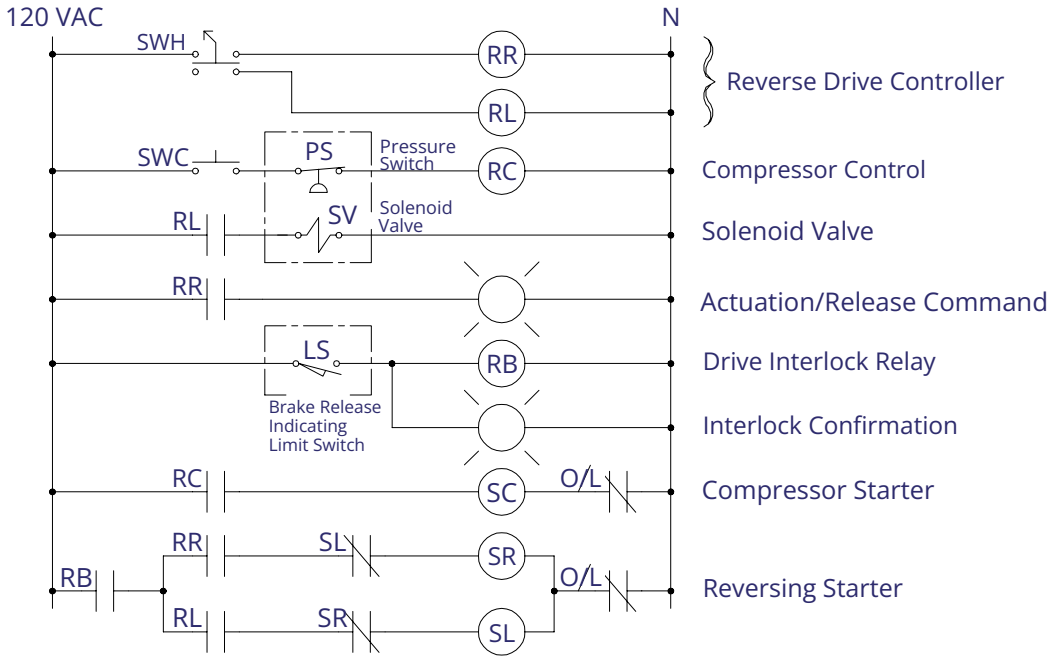
Electrical controls & logic

DRAWING
AUHC01-1.1



Components
By Johnson Ind.

TYPICAL ELECTRICAL CONTROLS & LOGIC



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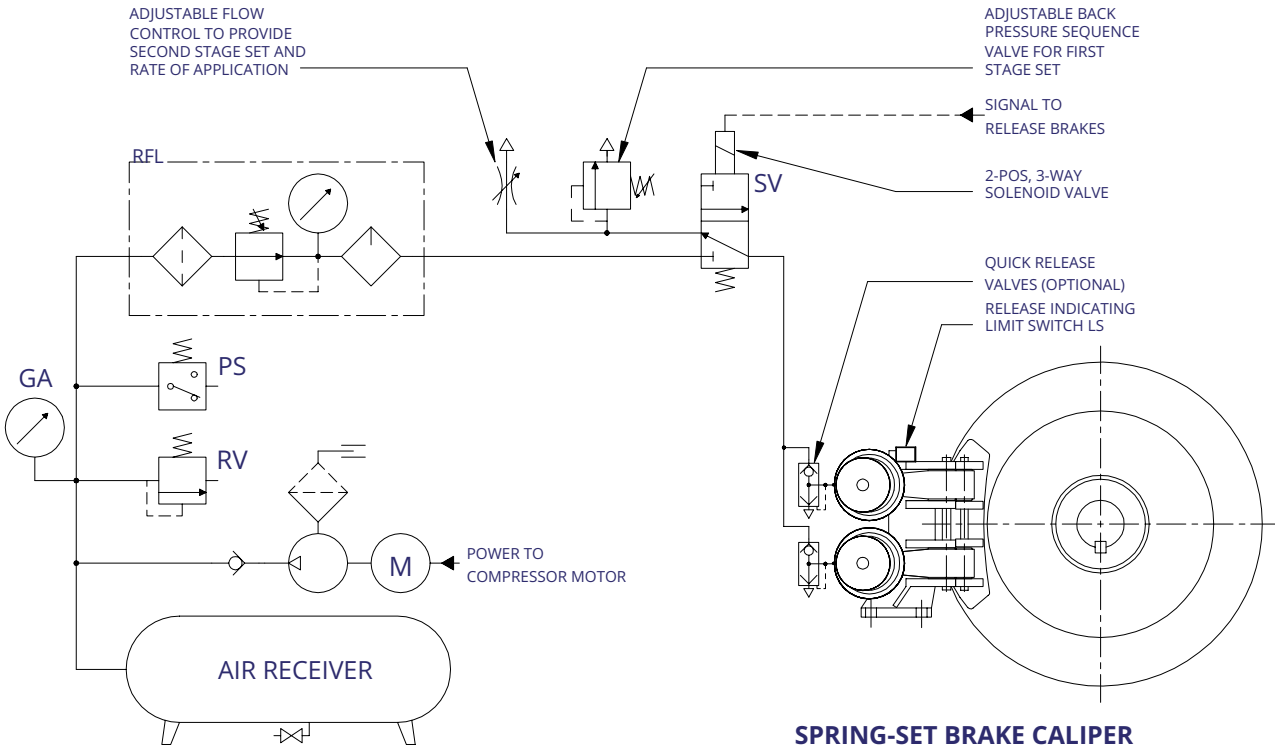
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Typical Disc Brake Controls

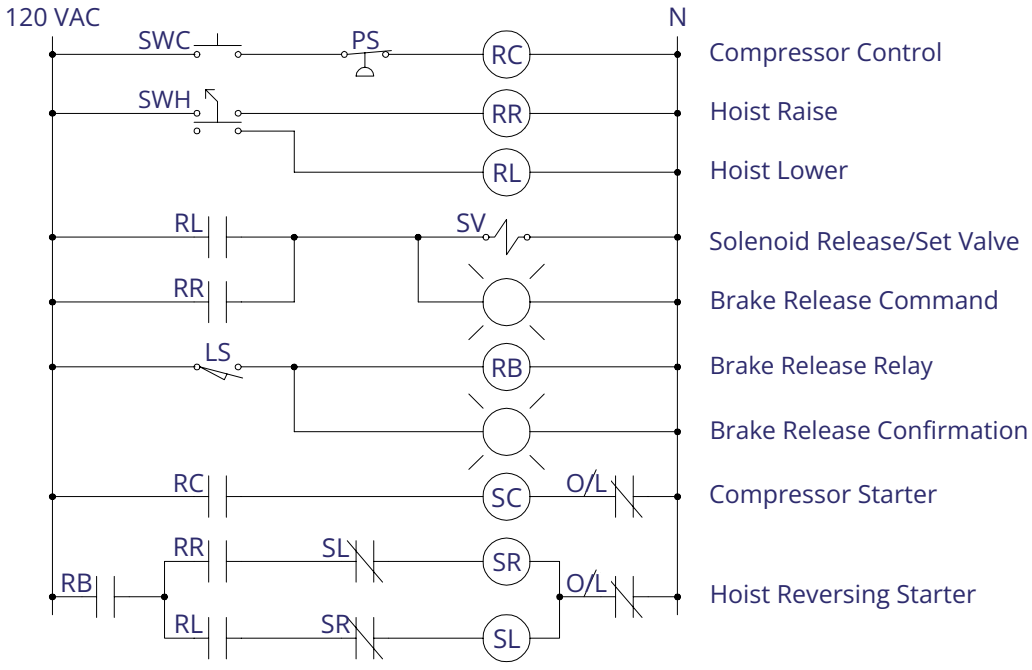
Spring-set & air released · two-stage set

DRAWING
BAC04-1.0



SPRING-SET BRAKE CALIPER

TYPICAL ELECTRICAL CONTROLS & LOGIC



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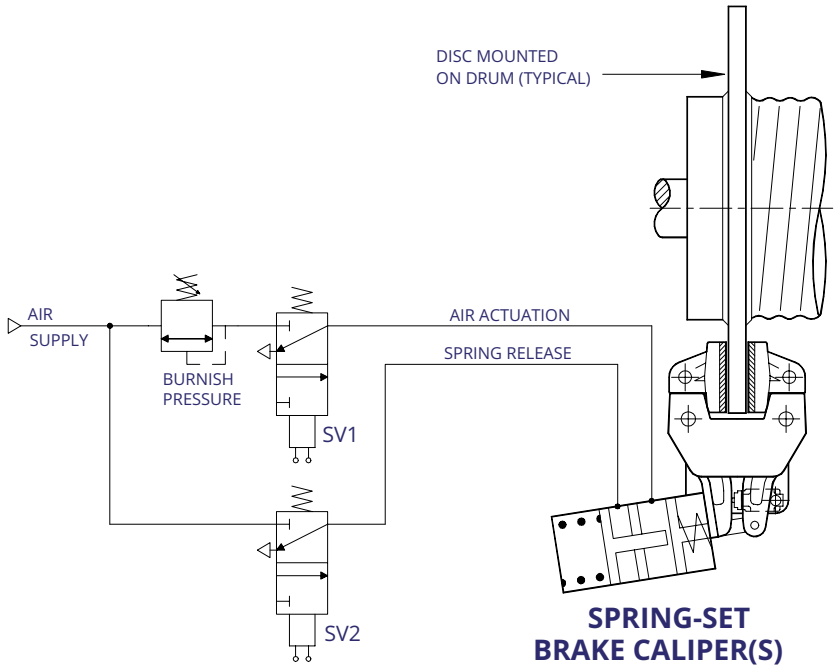
Typical Hoist Disc Brake Controls

Spring-set & air released · air burnish pressure (down only)

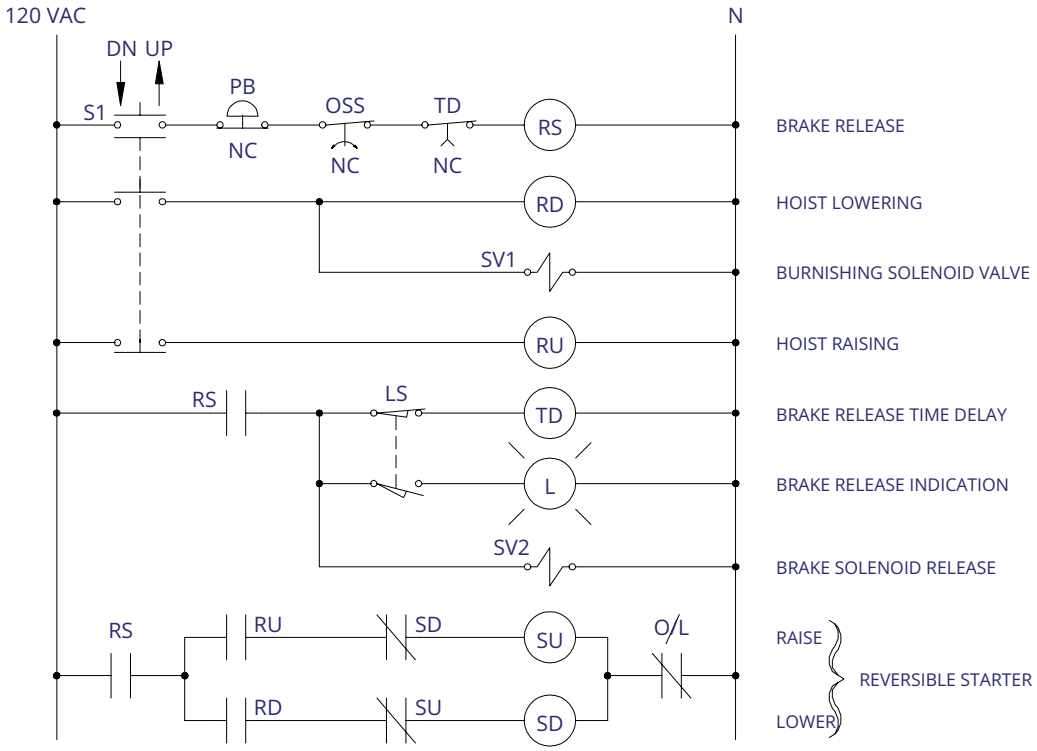
DRAWING
BAC09-1.0

LEGEND

- S1 - UP/DOWN SWITCH
- PB - NORMALLY CLOSED PANIC BUTTON
- OSS - NORMALLY CLOSED OVERSPEED SWITCH
- TD - NORMALLY CLOSED BRAKE RELEASE TIME DELAY
- L - BRAKE RELEASE INDICATOR LIGHT
- LS - BRAKE RELEASE LIMIT SWITCH (ONE OR SEVERAL IN SERIES)
- O/L - OVERLOAD RELAY
- SV1 - BURNISH AIR PRESSURE SOLENOID VALVE
- SV2 - SPRING RELEASE AIR PRESSURE SOLENOID VALVE
- RS - SPRING RELEASE RELAY
- RD - LOWER RELAY
- RU - RAISE RELAY
- SD - LOWER MOTOR STARTER
- SU - RAISE MOTOR STARTER



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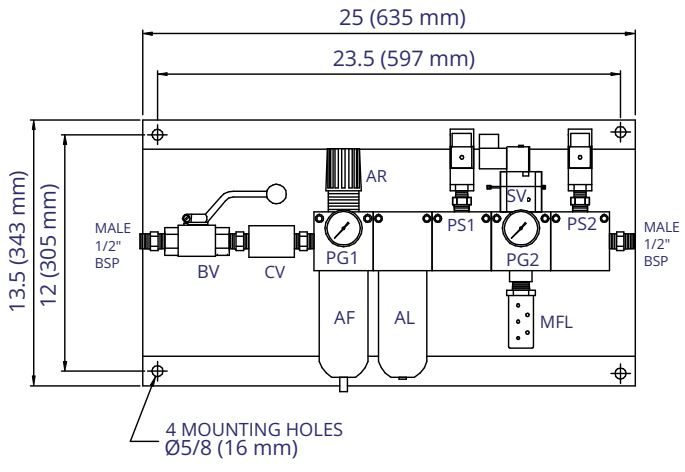
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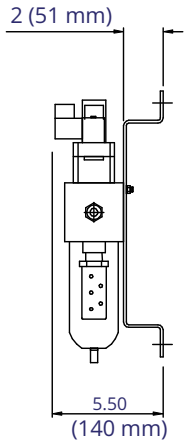
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Air Control Panel

Assembly & schematic

DRAWING
B5071-02.2

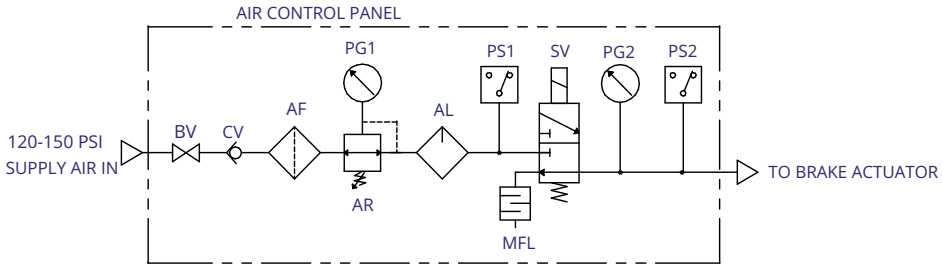




AIR CONTROL PANEL ASSEMBLY

LEGEND

AF - AIR FILTER
AL - AIR LUBRICATOR
AR - AIR REGULATOR
BV - BALL VALVE (LOCKABLE)
CV - CHECK VALVE
MFL - EXHAUST MUFFLER
PG1, PG2 - PRESSURE GAUGE
PS1, PS2 - PRESSURE SWITCH
SV - SOLENOID VALVE



AIR CONTROL SCHEMATIC

Notes

- **MAXIMUM PRESSURE:** 120 PSI (8.3 BAR)
- **AMBIENT TEMPERATURE:** 4°C - 50°C
- **PRESSURE SWITCH:**
- **SOLENOID VALVE:**
- **FILTER:** 5 MICRON
- **REGULATOR:** 0 - 120 PSI
- **LUBRICATOR:** ISO VG10 OIL

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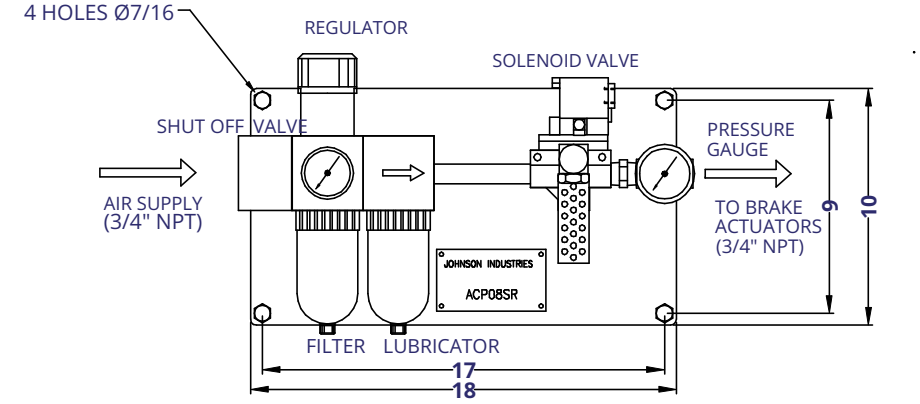
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ACP08SR Air Control Panel

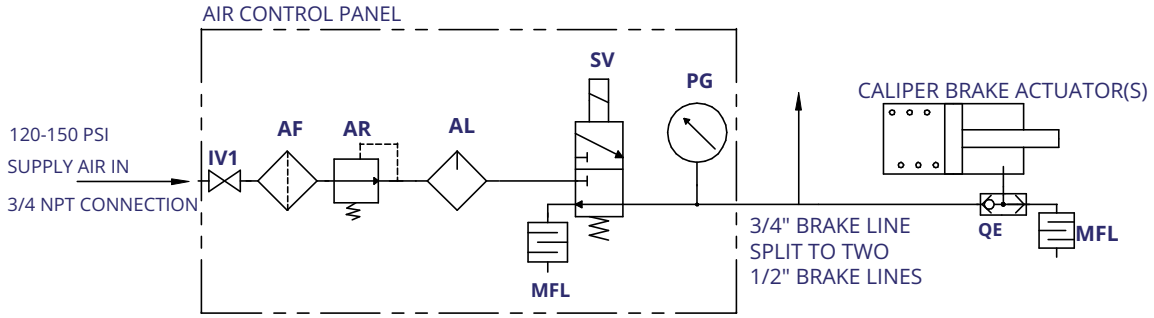
Specification drawing

DRAWING
B5051-10.0

LAY OUT



SCHEMATIC



LEGEND

AF	AIR FILTER
AL	AIR LUBRICATOR
AR	AIR REGULATOR
SV	SOLENOID POPPET VALVE
MFL	EXHAUST MUFFLER
PG	PRESSURE GAUGE
IV1	SHUT OFF VALVE
QE	QUICK EXHAUST VALVE

Notes

- **MAX PRESSURE:** 150 PSI
- **AMBIENT TEMPERATURE:**
- **FLOW COEFFICIENT (panel only):**
  – RELEASE: Cv = 2.2
  – EXHAUST: Cv = 5.6
- **SOLENOID VALVE:** 1/2 NPT, 3/2 WAY, N.C., POPPET
  – ELECTRICAL RATINGS:
- **FILTER:** 5 MICRON
- **LUBRICATOR:** ISO VG10 OIL
- **REGULATOR:** 0-125 PSI
- **APPROXIMATE WEIGHT:** 35 lbs

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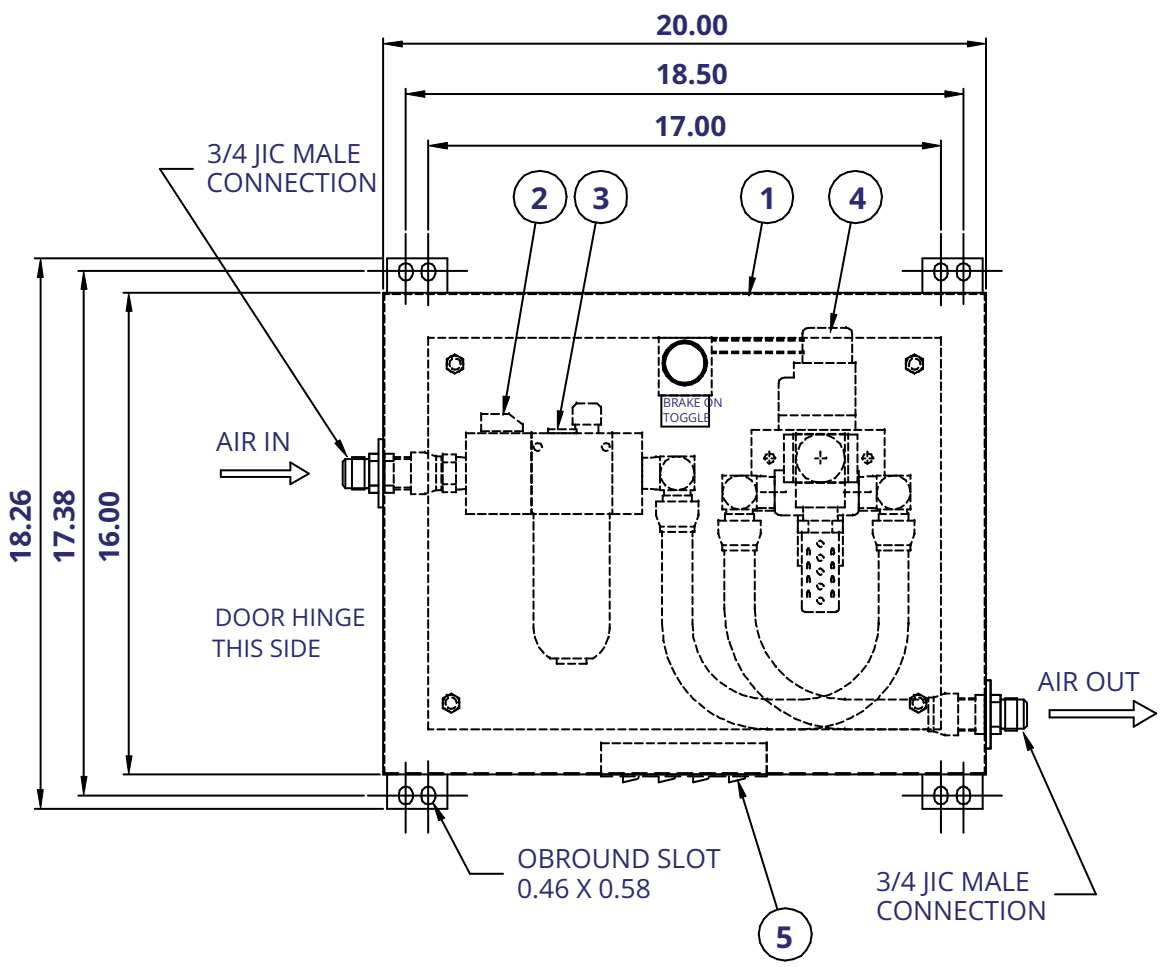
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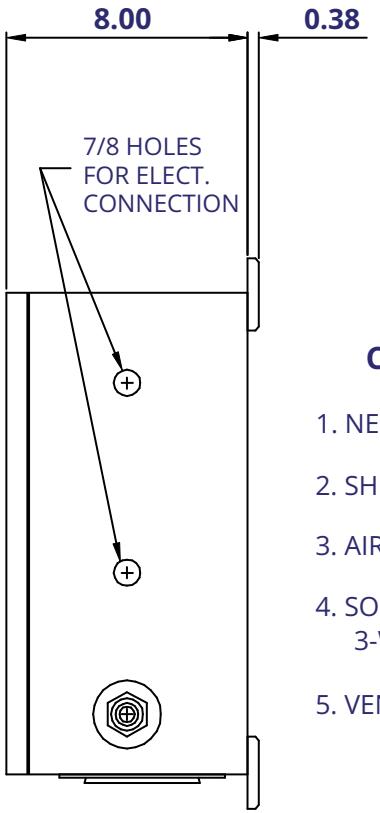
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Air Control Panel

NEMA 4 enclosure

DRAWING
ACP50A-S3.0





COMPONENTS:

1. NEMA 4 ENCLOSURE
2. SHUT-OFF VALVE
3. AIR LUBRICATOR
4. SOLENOID VALVE
   3-WAY/2-POSITION, N.C.
5. VENT PLATE C/W FILTER

Notes

- DIMENSIONS: INCHES

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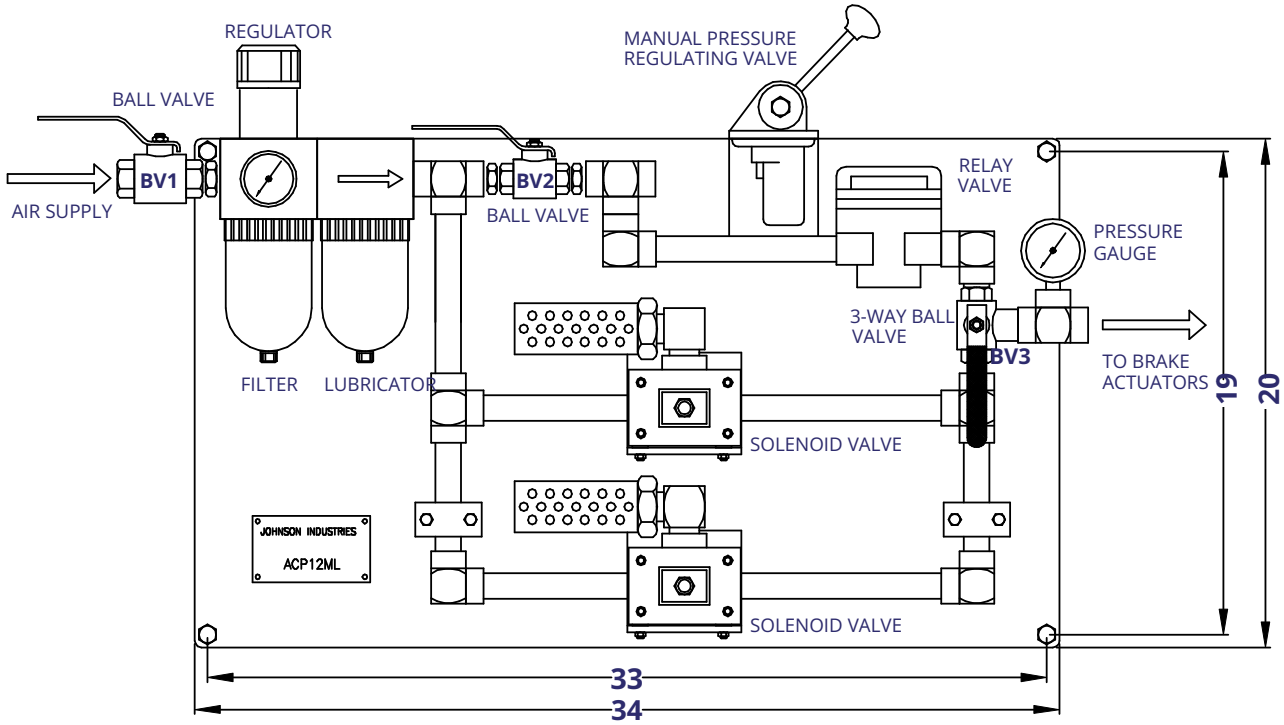
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ACP12ML Air Control Panel

Dual solenoid · manual control valve

DRAWING
B4179-10.2



Notes

- **FILTER:** 5 MICRON, AUTOMATIC DRAIN
- **LUBRICATOR:** USE GULF LOWTHERM 10 OIL OR EQUAL
- **REGULATOR:** SET FOR 120 PSI
- **MANUAL VALVE:** 3 WAY, 0-100 PSI REGULATING
- **RELAY VALVE:** 3/4 NPT, 1:1 RATIO
- **SOLENOID VALVE:** 3/4 NPT, 3/2 WAY, NC, POPPET DIN CONNECTED
- **MANUAL OPERATION:**
  – TURN HANDLE OF BALL VALVES BV1 & BV2 TO ON POSITION AS SHOWN.
  – TURN HANDLE OF 3-WAY BALL VALVE BV3 TO VERTICAL, 6 O'CLOCK, POSITION.
  – CLOCKWISE LEVER MOVEMENT OF THE MANUAL REGULATING VALVE INCREASES PRESSURE AT THE OUTLET PORT AND REDUCES THE BRAKE TORQUE.
- **OPERATION BY SOLENOID VALVES:**
  – TURN HANDLE OF BALL VALVE BV1 TO ON POSITION.
  – TURN HANDLE OF BALL VALVE BV2 TO OFF POSITION.
  – TURN HANDLE OF 3-WAY BALL VALVE TO HORIZONTAL POSITION.

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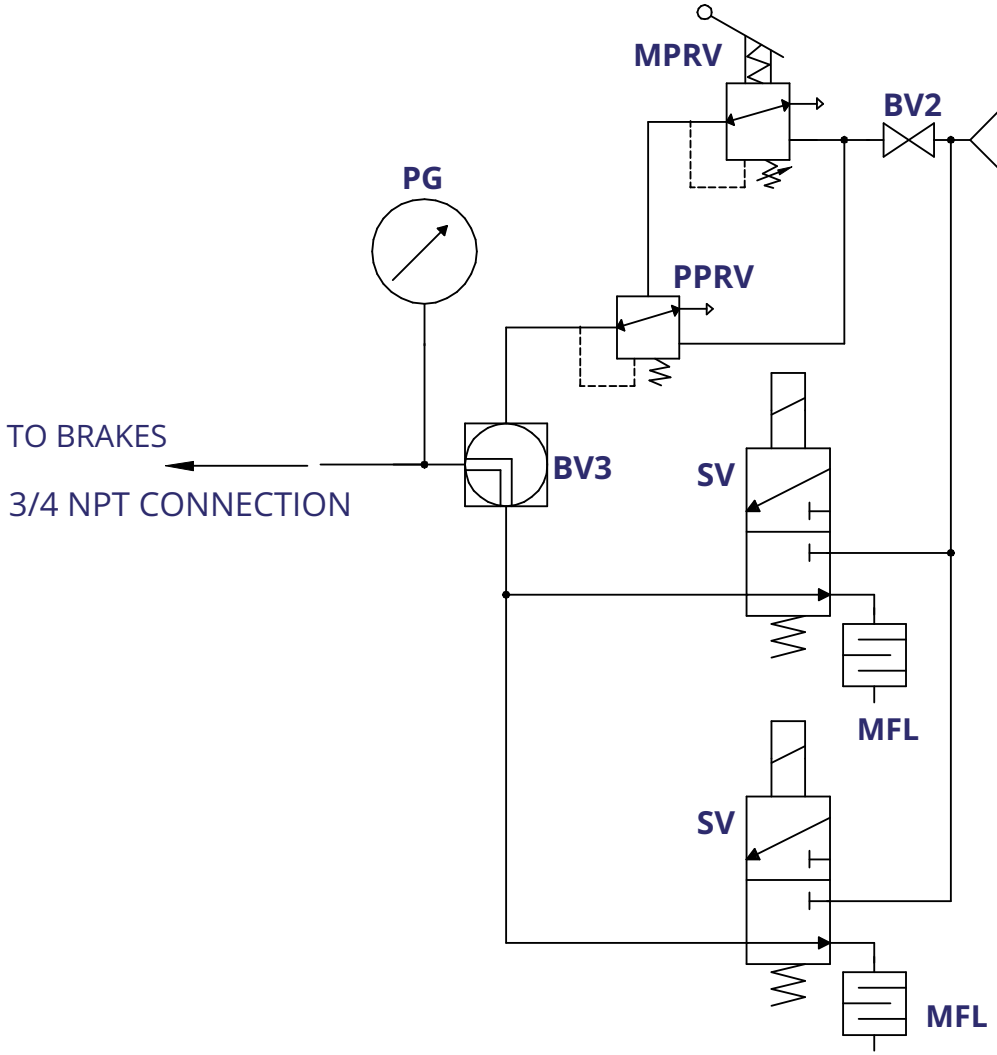
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ACP12ML Air Control Panel

Pneumatic circuit diagram

DRAWING
B4179-11.0



AF	AIR FILTER
AL	AIR LUBRICATOR
AR	AIR REGULATOR
MPRV	MANUAL PRESSURE REGULATING VALVE
PPRV	PILOT OPERATED PRESSURE REGULATING VALVE
SPV	SOLENOID POPPET VALVE
MFL	EXHAUST MUFFLER
PG	PRESSURE GAUGE
BV1,2	BALL VALVE
BV3	3-WAY BALL VALVE

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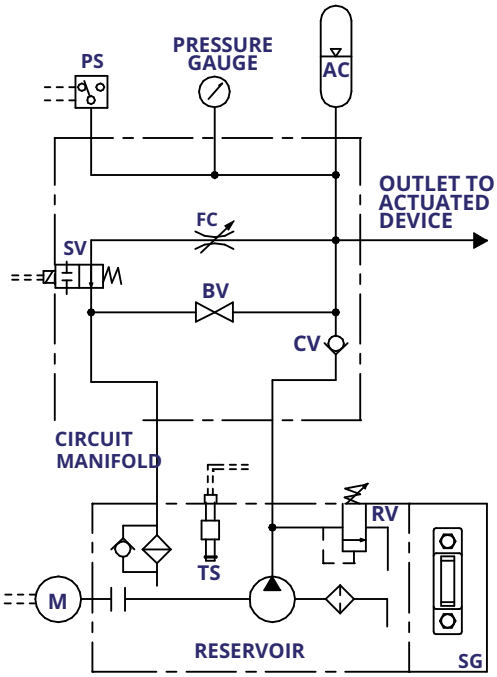
HL-SD Hydraulic Power Unit

Hydraulic & interlock circuits

DRAWING
HLSDC-01.0

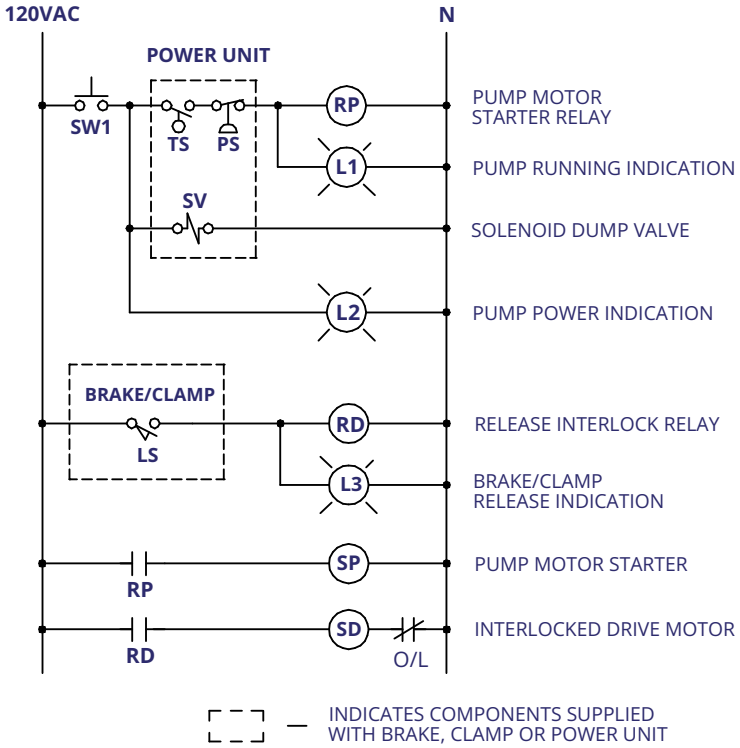
HL-SD HYDRAULIC CIRCUIT

(COMPONENTS SUPPLIED WITH POWER UNIT)



TYPICAL INTERLOCK CIRCUIT

(SOME COMPONENTS BY OTHERS)



LEGEND

AC - ACCUMULATOR
BV - BLEED VALVE
CV - CHECK VALVE
FC - BRAKE/CLAMP SET RATE CONTROL VALVE
L1 - PUMP RUNNING INDICATOR LIGHT
L2 - PUMP POWER INDICATOR LIGHT
L3 - BRAKE/CLAMP MODE INDICATOR LIGHT
LS - MODE INTERLOCK LIMIT SWITCH
M - PUMP MOTOR
O/L - DRIVE MOTOR OVERLOAD
PS - PRESSURE SWITCH
RD - BRAKE/CLAMP MODE INTERLOCK RELAY
RP - PUMP MOTOR STARTER RELAY
RV - RELIEF VALVE
SD - DRIVE MOTOR STARTER
SP - PUMP MOTOR STARTER
SG - LEVEL SIGHT GLASS
SV - SOLENOID DUMP VALVE
SW1 - DRIVE SWITCH
TS - TANK LEVEL SWITCH

Notes

- ACTUATION OF A SWITCHING DEVICE (SW) CLOSES (SV) AND OPERATES THE PUMP, ACTUATES A DEVICE AND CHARGES THE SYSTEM UNTIL PRESSURE SWITCH (PS) SHUTS OFF THE PUMP MOTOR. ACCUMULATOR (AC) COMPENSATES FOR INTERNAL LEAKAGE. WHEN (SW) IS OPENED OR A POWER FAILURE OCCURS, (SV) OPENS AND THE SYSTEM DISCHARGES TO TANK. THIS POWER UNIT REQUIRES A FEW MOMENTS TO ACTUATE A DEVICE AND IS INTENDED FOR USE WITH DEVICES SUCH AS SPRING-SET PRESSURE-RELEASED BRAKES WHICH ARE CYCLED INFREQUENTLY DURING PROLONGED OPERATING PERIODS WHEN PRESSURE IS REQUIRED.

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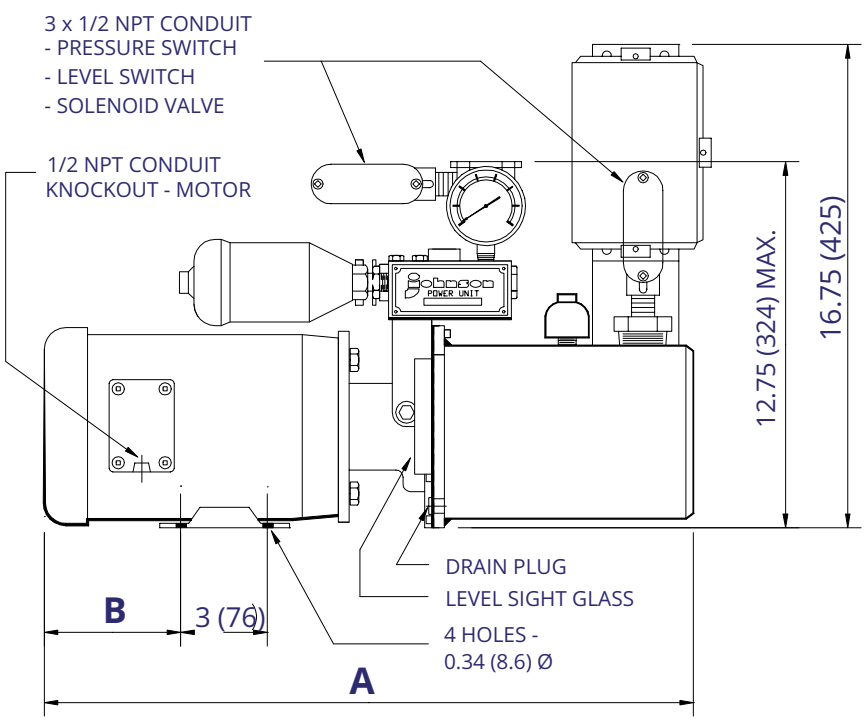
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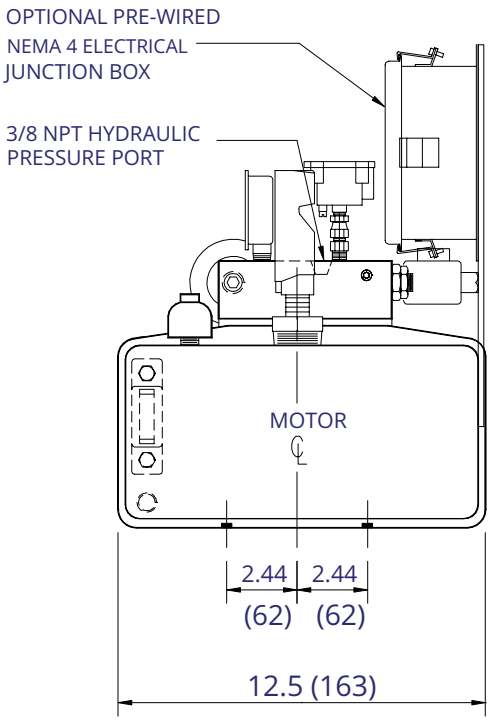
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HL-SD Hydraulic Power Unit (Solenoid Dump)

DRAWING
HLSDU-01.1





Specifications

Dual imperial / metric (usgpm/lpm, usg/l, hp/kw, in./mm, lb/kg)

- DIMENSIONS: Inches (mm)
- Motor mounted
- Standard motors are 1725 RPM TEFC, 230/460 V 3PH 60 Hz and 380 V 3PH 50 Hz
- Maximum operating pressures: 1200 PSI (8.27 MPa) continuous or 1500 PSI (10.34 MPa) intermittent
- Weights are without oil in tank and with 3PH TEFC motor
- 3 × 1/2 NPT conduit — pressure switch, level switch, solenoid valve
- 1/2 NPT conduit knockout — motor
- Optional pre-wired NEMA 4 electrical junction box
- 3/8 NPT hydraulic pressure port
- Drain plug; level sight glass; 4 holes 0.34 in (8.6 mm) Ø

Model no.	Free flow usgpm/lpm	Tank capacity usg/l	Motor hp/kw	A	B	Weight lb/kg
HL045SD	0.45 / 1.70	1 / 4	0.5 / 0.37	18.5/470	3.63/92	62 / 28
HL082SD	0.82 / 3.10	1 / 4	0.75 / 0.56	18.5/470	3.63/92	65 / 30
HL112SD	1.12 / 4.24	2 / 6	1.0 / 0.75	22.5/572	4.5/114	74 / 34
HL164SD	1.64 / 6.21	2 / 6	1.5 / 1.12	22.5/572	4.5/114	77 / 35
HL216SD	2.16 / 8.18	3 / 11	2.0 / 1.49	26.5/673	5.5/140	87 / 40
HL283SD	2.83 / 10.7	3 / 11	3.0 / 2.24	27.5/698	6.5/165	98 / 45
HL556SD	5.56 / 21.05	4 / 15	5.0 / 3.73	31.5/800	6.5/165	125 / 57

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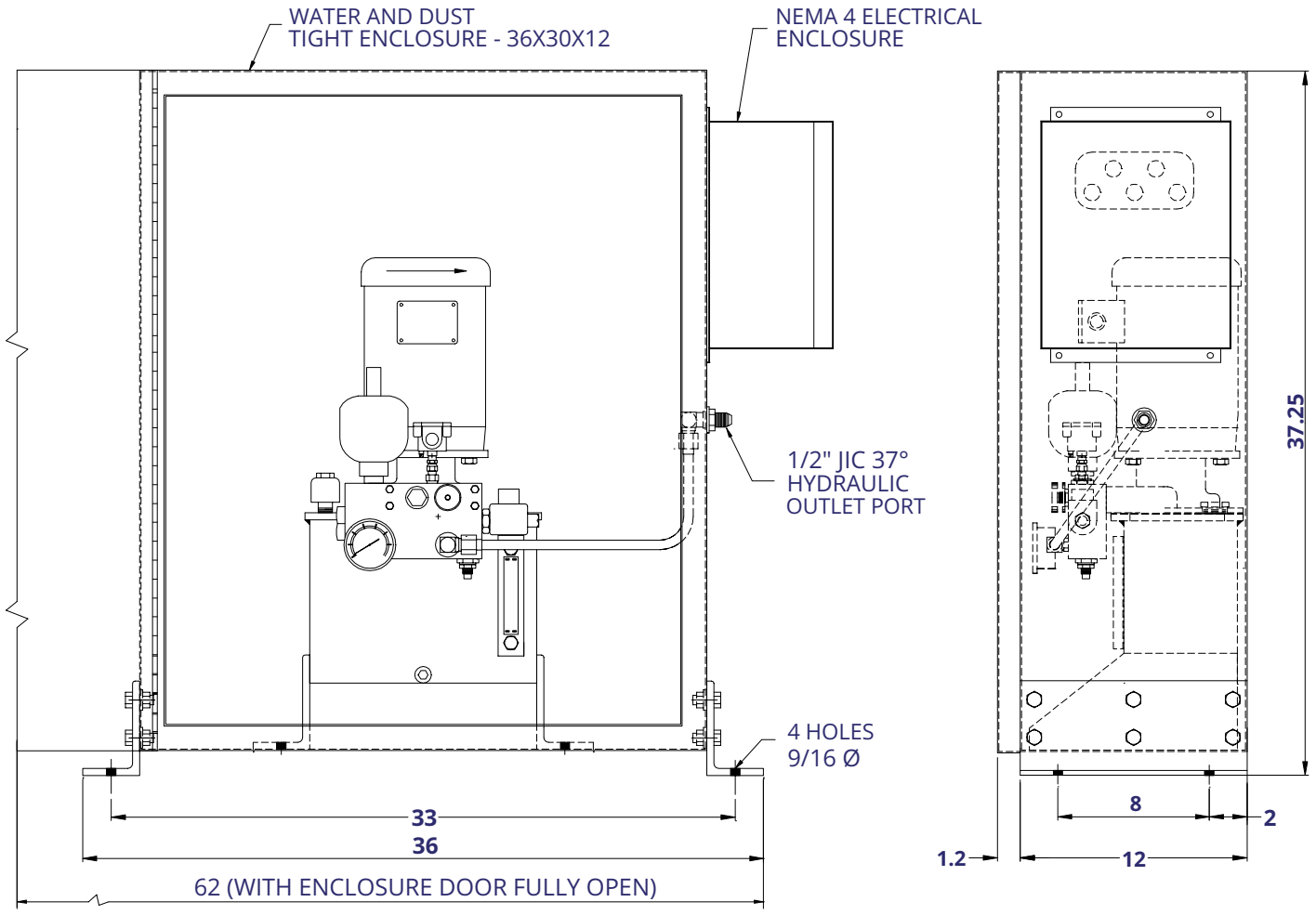
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HL***SD Hydraulic Unit

Solenoid dump

DRAWING
HL***SD-01.0



Notes

- **MODEL:** HL***SD - SOLENOID DUMP
- **APPLICATION:** TO CONTROL BRAKING DEVICES
- **RECOMMENDED HYDRAULIC LINE SIZE:** 3/8" I.D.
- **RECOMMENDED HYDRAULIC FLUID:** SHELL TELLUS T32
- **SETTINGS:**
  - A. CUT OUT: 1500 PSI (Nominal)
  - B. CUT IN: 1300 PSI (Minimum)
  - C. RELIEF: 1950 PSI (Nominal)
  - D. ACCUMULATOR: 1200 PSI (Cold)
- **COATINGS:** ONE COAT SHOP PRIMER PLUS TWO COATS POLYURETHANE EPOXY PAINT
- **COMPONENTS:**
  - A. PUMP: 1.12 USGPM
  - B. MOTOR: 1.0HP
  - C. SOLENOID VALVE
  - D. PRESSURE SWITCH
  - E. LEVEL SWITCH
- **APPROXIMATE WEIGHT:** 225 LB.
- **QUANTITY:** (1) ONE
- **OPTIONS:**
- Dimensions: Inches

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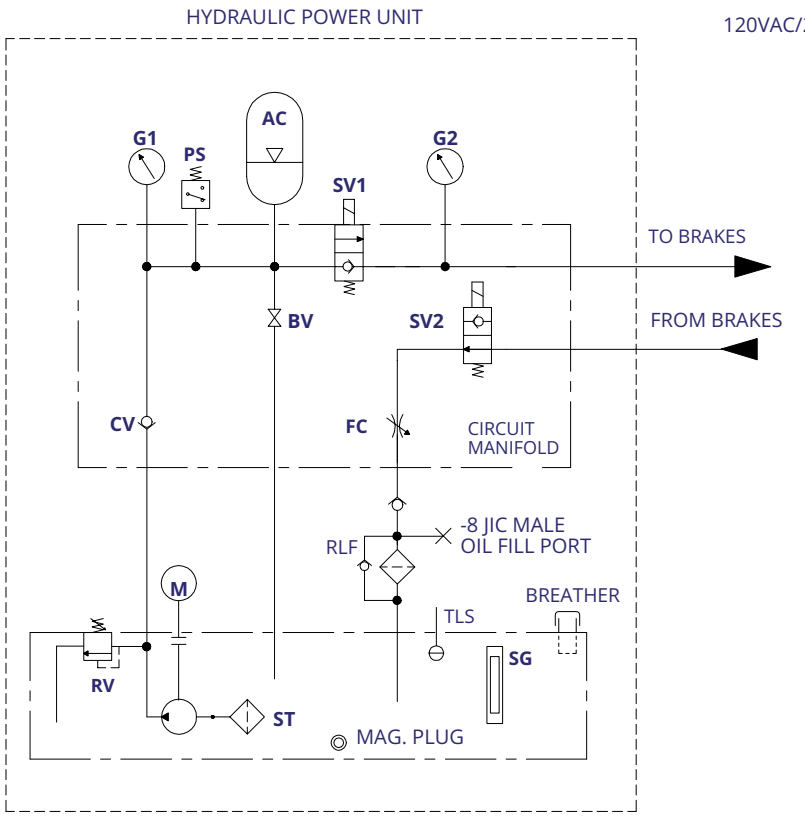
HL-SR Hydraulic Power Unit

Hydraulic & interlock circuits

DRAWING
HLSRC-01.2

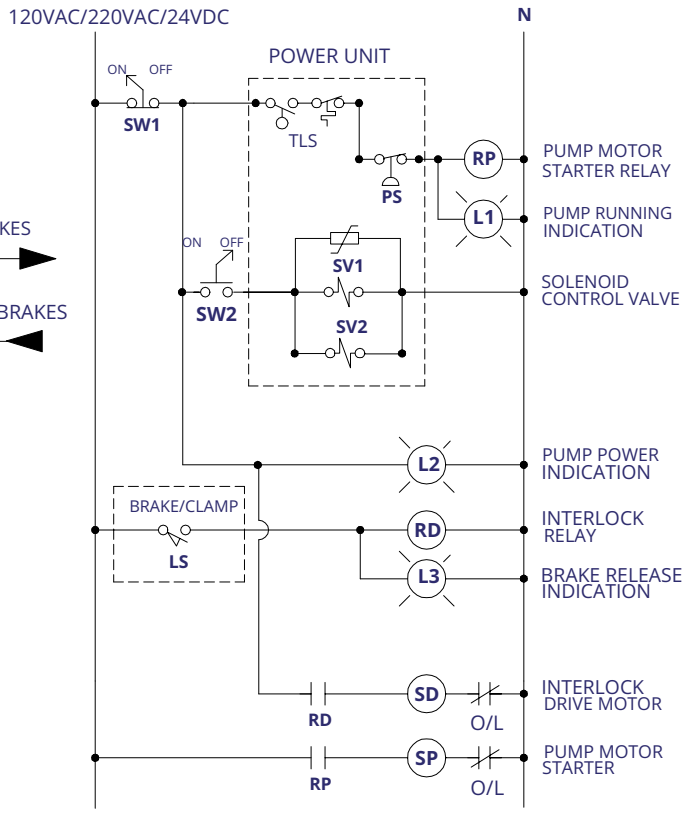
HL***SR HYDRAULIC CIRCUIT

(COMPONENTS SUPPLIED WITH POWER UNIT)



TYPICAL INTERLOCK CIRCUIT

= SUPPLIED BY JOHNSON INDUSTRIES



LEGEND

AC - ACCUMULATOR
BV - BLEED VALVE
CV - CHECK VALVE
FC - BRAKE/CLAMP ACTUATION RATE CONTROL VALVE
L1 - PUMP RUNNING INDICATOR LIGHT
L2 - PUMP POWER INDICATOR LIGHT
L3 - BRAKE/CLAMP MODE INDICATOR LIGHT
LS - MODE INTERLOCK LIMIT SWITCH
M - PUMP MOTOR
O/L - DRIVE MOTOR OVERLOAD
PS - PRESSURE SWITCH
RD - BRAKE/CLAMP MODE INTERLOCK RELAY
RP - PUMP MOTOR STARTER RELAY
RV - RELIEF VALVE
SD - DRIVE MOTOR STARTER
SP - PUMP MOTOR STARTER
SG - LEVEL SIGHT GLASS
SV1,SV2 - SOLENOID DUMP VALVE
SW1 - DRIVE SWITCH
TLS - TEMPERATURE/LEVEL SWITCH

Notes

- ACTUATION OF A SWITCHING DEVICE (SW1) STARTS THE PUMP AND PRECHARGES THE SYSTEM UNTIL PRESSURE SWITCH (PS) SHUTS OFF THE PUMP MOTOR. ACCUMULATOR (AC) COMPENSATES FOR INTERNAL LEAKAGE AND PROVIDES A CHARGE OF OIL FOR RELEASING THE BRAKE BY MEANS OF (SW2) AND SOLENOID VALVES (SV1)(SV2). THE PUMP IS RESTARTED AND THE SYSTEM RECHARGES AS REQUIRED. IT MAY BE DISCHARGED MANUALLY TO TANK BY BLEED VALVE (BV). FLOW CONTROL VALVE (FC) REGULATES THE BRAKE SETTING TIME.

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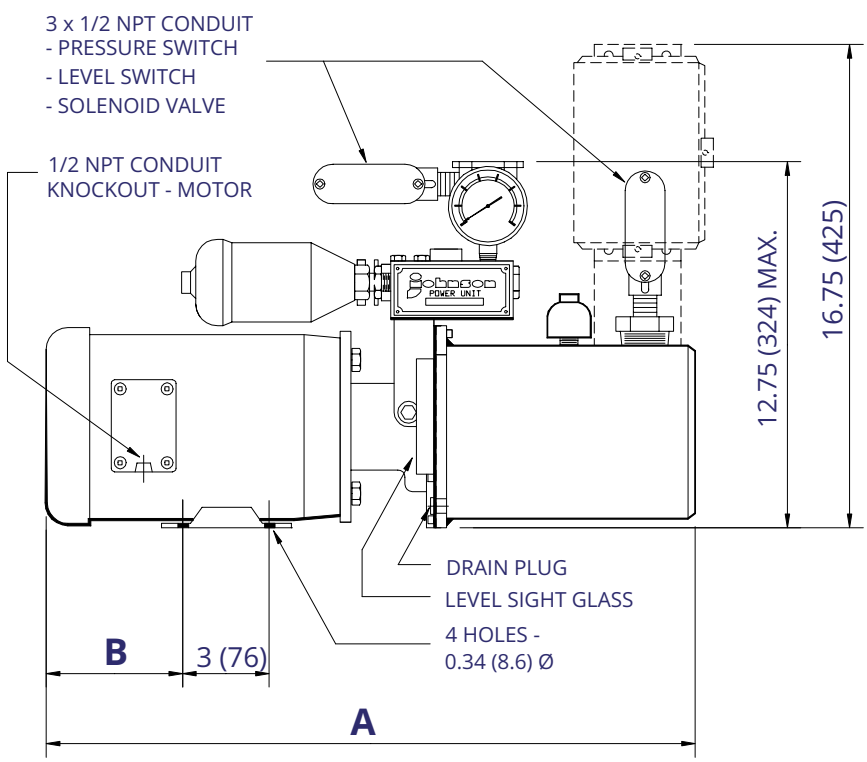
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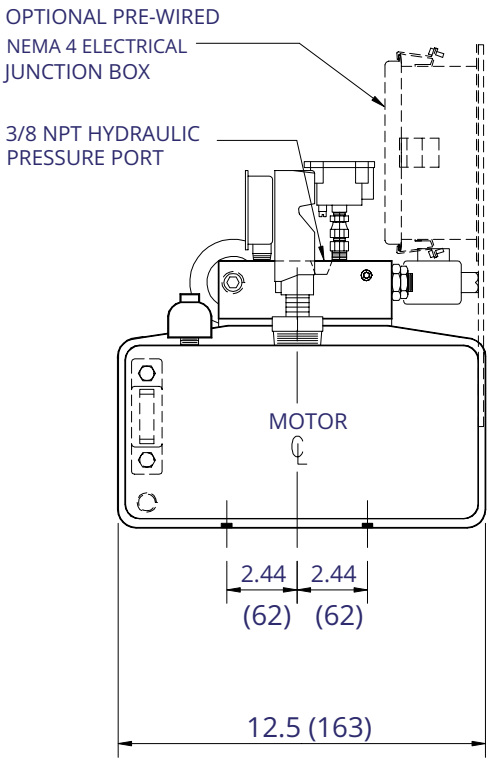
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HL-SR Hydraulic Power Unit (Solenoid Release)

DRAWING
HLSRU-01.0





Specifications

Dual imperial / metric (usgpm/lpm, usg/l, hp/kw, in./mm, lb/kg)

- DIMENSIONS: Inches (mm)
- Motor mounted
- Standard motors are 1725 RPM TEFC, 230/460 V 3PH 60 Hz and 380 V 3PH 50 Hz
- Maximum operating pressures: 1200 PSI (8.27 MPa) continuous or 1500 PSI (10.34 MPa) intermittent
- Weights are without oil in tank and with 3PH TEFC motor
- 3 × 1/2 NPT conduit — pressure switch, level switch, solenoid valve
- 1/2 NPT conduit knockout — motor
- Optional pre-wired NEMA 4 electrical junction box
- 3/8 NPT hydraulic pressure port
- Drain plug; level sight glass; 4 holes 0.34 in (8.6 mm) Ø

Model no.	Free flow usgpm/lpm	Tank capacity usg/l	Motor hp/kw	A	B	Weight lb/kg
HL045SR	0.45 / 1.70	1 / 4	0.5 / 0.37	18.5/470	3.63/92	62 / 28
HL082SR	0.82 / 3.10	1 / 4	0.75 / 0.56	18.5/470	3.63/92	65 / 30
HL112SR	1.12 / 4.24	2 / 6	1.0 / 0.75	22.5/572	4.5/114	74 / 34
HL164SR	1.64 / 6.21	2 / 6	1.5 / 1.12	22.5/572	4.5/114	77 / 35
HL216SR	2.16 / 8.18	3 / 11	2.0 / 1.49	26.5/673	5.5/140	87 / 40
HL283SR	2.83 / 10.7	3 / 11	3.0 / 2.24	27.5/698	6.5/165	98 / 45

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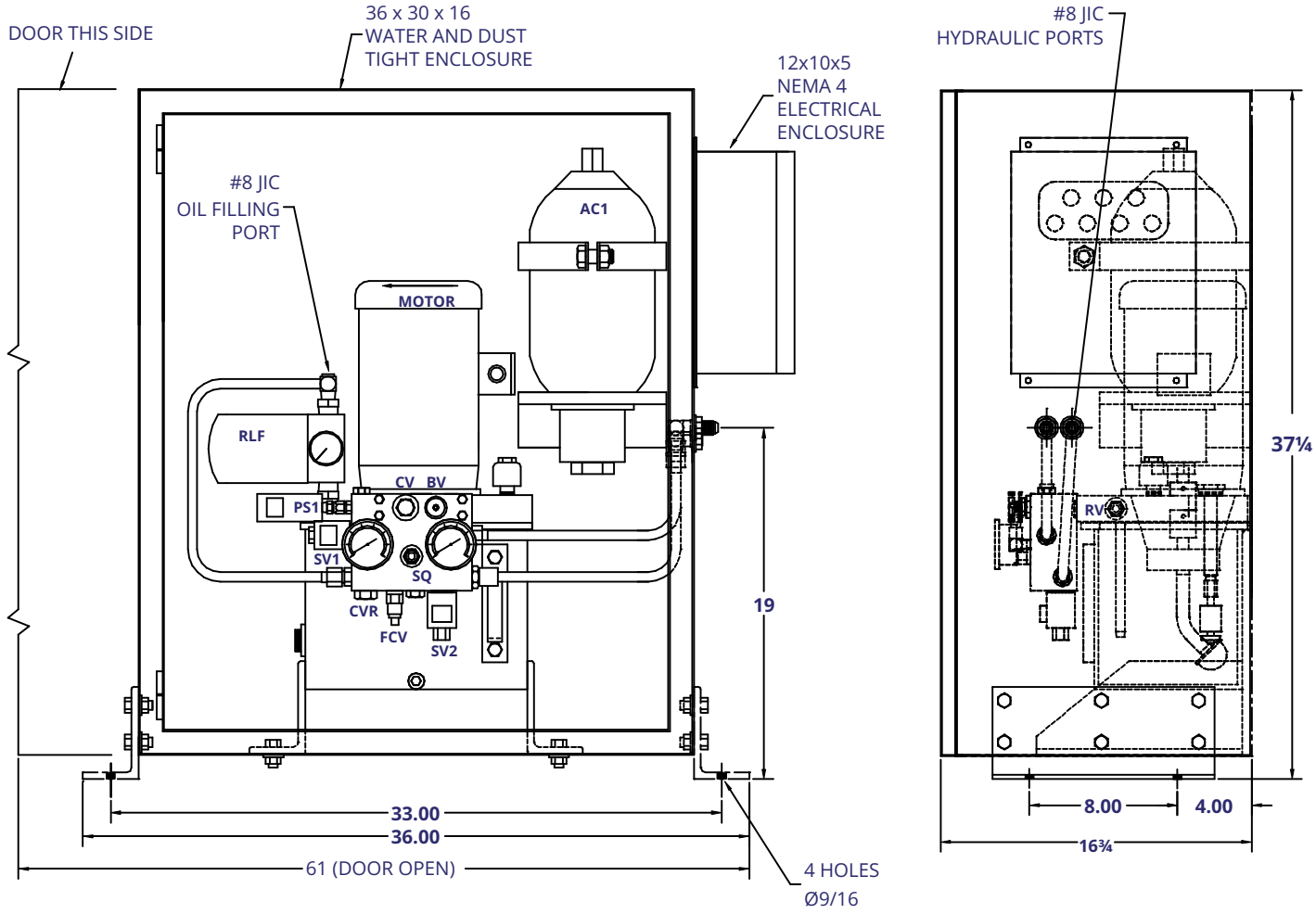
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HL112SR Hydraulic Control Unit

Specification drawing

DRAWING
A4989-10.1



Notes

- **MODEL:** HL112SR - SOLENOID RELEASE/DUMP
- **APPLICATION:** CONTROL OF BRAKE OR CLAMP.
- **REQUIRED HYDRAULIC LINE SIZE:**
  - OUTLET: Ø1/2
  - RETURN: Ø1/2
- **RECOMMENDED HYDRAULIC FLUID:** SHELL TELLUS T32
- **SETTINGS:**
  - A. N/A
  - B. PS1 SWITCH CUT-IN: 2400 psi
  - C. RELIEF: 2950 psi
  - D. ACCUMULATOR AC1: 2000 psi (Cold)
  - ACCUMULATOR AC2: N/A
- **COATINGS:** MACHINE ENAMEL (GRAY)
- **COMPONENTS:**
  - A. PUMP: 1.0 USGPM
  - B. MOTOR: 2.0 HP
  - C. SOLENOID VALVES
  - D. PRESSURE SWITCH
  - E. TEMP/LEVEL SWITCH: 50VA
  - F. ACCUMULATOR: 230 CU. IN.
  - G. FILTER: 10 MICRON ABSOLUTE
  - H. RESERVOIR: 2.5 USG
- **APPROXIMATE WEIGHT:** 310 LB.
- **QUANTITY:**
- **OPTIONS:** NONE

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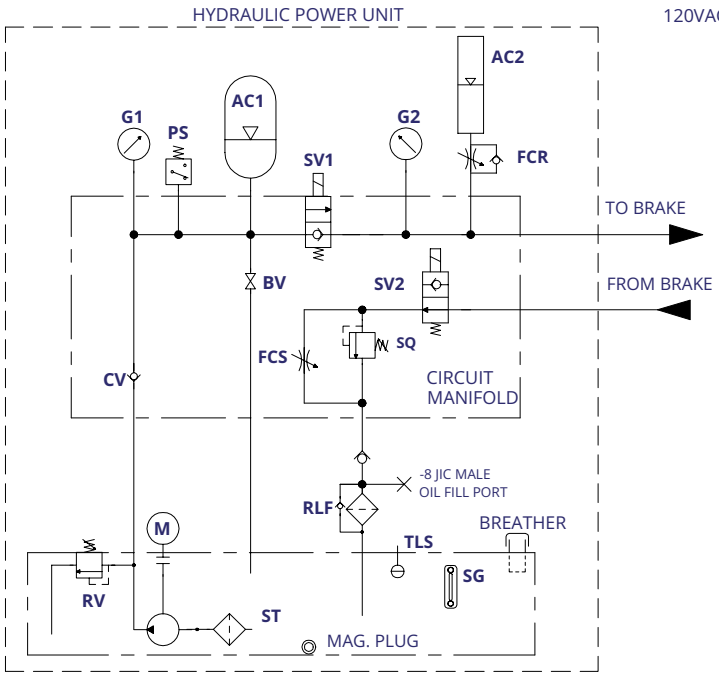
HL***SRD Hydraulic Power Unit

Hydraulic & interlock circuits

DRAWING
HLSRD-02.0

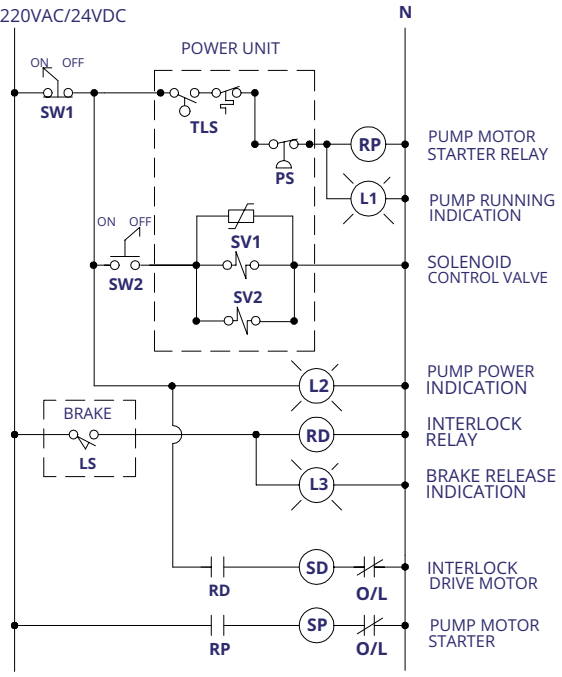
HL***SRD HYDRAULIC CIRCUIT

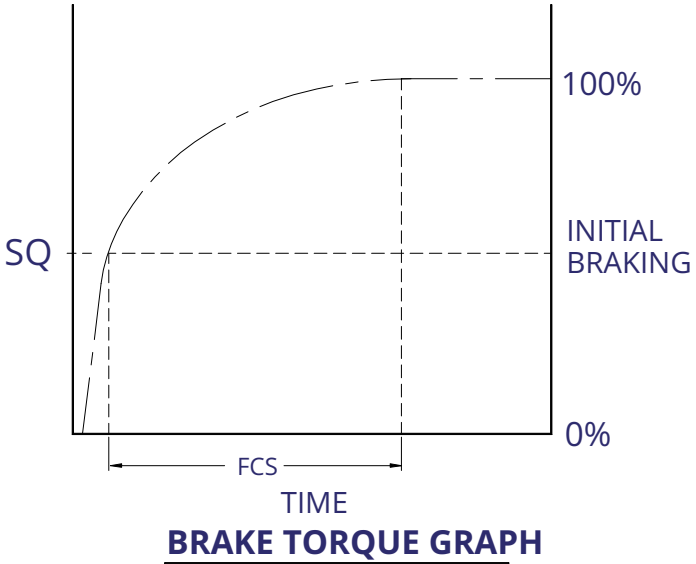
(COMPONENTS SUPPLIED WITH POWER UNIT)



TYPICAL INTERLOCK CIRCUIT

= SUPPLIED BY J.I.L.





BRAKE TORQUE GRAPH

LEGEND

AC1 - BLADDER ACCUMULATOR
AC2 - PISTON ACCUMULATOR
BV - BLEED VALVE
CV - CHECK VALVE
FCR - FLOW CONTROL VALVE
FCS - FLOW CONTROL VALVE
L1 - PUMP RUNNING INDICATOR LIGHT
L2 - PUMP POWER INDICATOR LIGHT
L3 - BRAKE MODE INDICATOR LIGHT
LS - BRAKE MODE INTERLOCK LIMIT SWITCH
M - PUMP MOTOR
O/L - MOTOR OVERLOAD
PS - PRESSURE SWITCH
RP - PUMP MOTOR STARTER RELAY
RLF - RETURN LINE FILTER
RV - RELIEF VALVE
SD - DRIVE MOTOR STARTER
SG - LEVEL SIGHT GLASS
SP - PUMP MOTOR STARTER
SQ - SEQUENCE VALVE
ST - SUCTION STRAINER
SV1,SV2 - SOLENOID DUMP VALVE
TLS - TEMPERATURE/LEVEL SWITCH

Notes

- ACTUATION OF A SWITCHING DEVICE (SW1) STARTS THE PUMP AND PRECHARGES THE SYSTEM UNTIL PRESSURE SWITCH (PS) SHUTS OFF THE MOTOR PUMP. ACCUMULATOR (AC1) COMPENSATES FOR INTERNAL LEAKAGE AND PROVIDES A CHARGE OF OIL FOR RELEASING THE BRAKE BY MEANS OF (SW2) AND SOLENOID VALVES (SV1)(SV2). THE PUMP IS RESTARTED AND THE SYSTEM RECHARGES AS REQUIRED. IT MAY BE DISCHARGED MANUALLY TO TANK BY BLEED VALVE (BV). ACCUMULATOR (AC2) PROVIDES BACK PRESSURE FOR CONTROLLED BRAKING FORCE.

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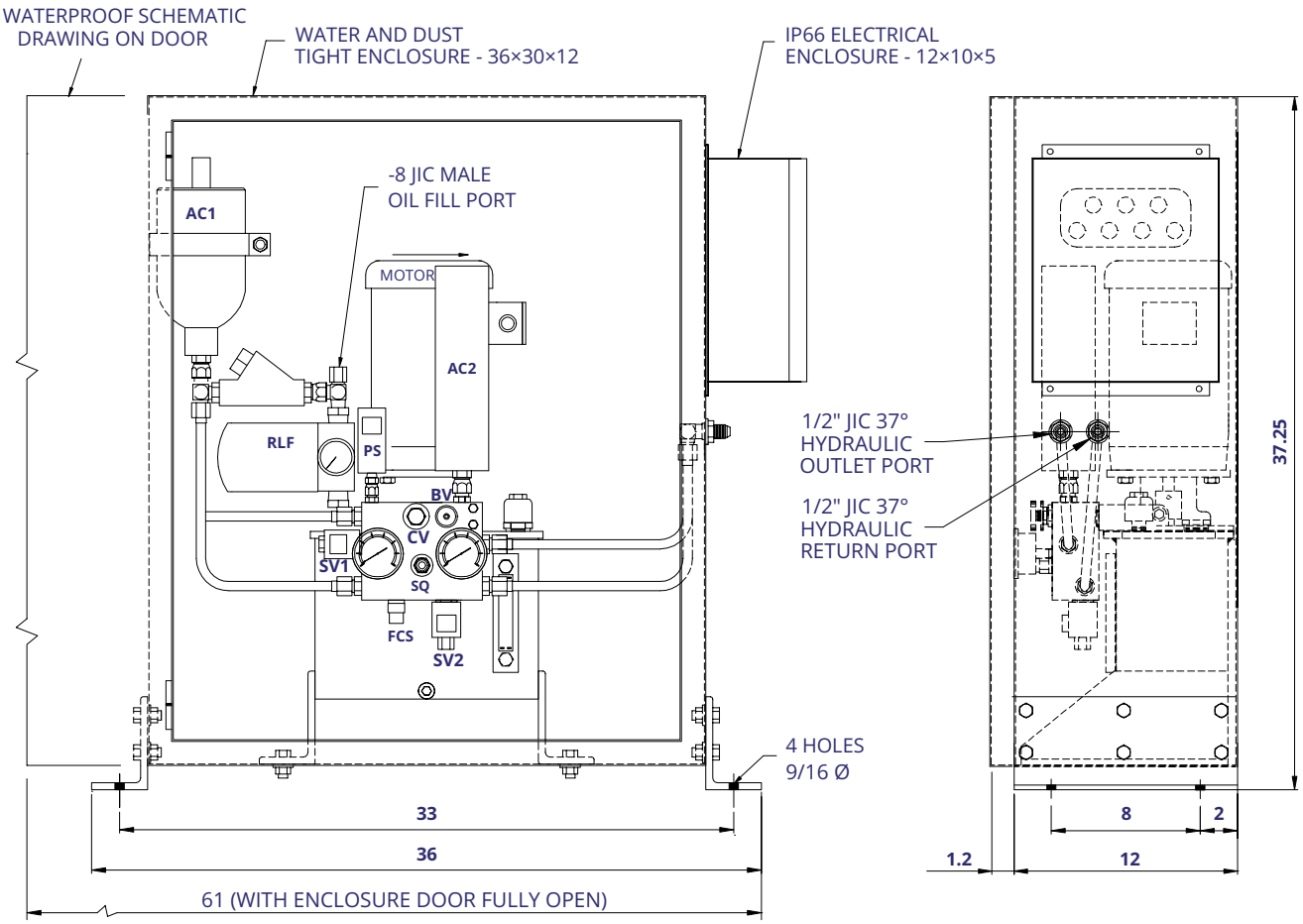
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HL***SRD Hydraulic Control Unit

Solenoid release / dump

DRAWING
HLSRD-01.0



Notes

- Dimensions: Inches

- **HYDRAULIC UNIT SPECIFICATIONS**
- **MODEL:** HL***SRD - SOLENOID RELEASE/DUMP

- **APPLICATION:** TO CONTROL BRAKING DEVICES
- **RECOMMENDED HYDRAULIC LINE SIZE:** 1/2" I.D.
- **RECOMMENDED HYDRAULIC FLUID:** SHELL TELLUS T32

- **SETTINGS:**
  - A. PRESSURE SWITCH CUT-OUT: 1500 psi (nominal)
  - B. PRESSURE SWITCH CUT-IN: 1300 psi
  - C. RELIEF: 1800 psi
  - D. ACCUMULATOR AC1: 1100 psi (Cold)
  - ACCUMULATOR AC2: 250 psi (cold)
  - F. FLOW CONTROL FCS: 5.0 secs
  - G. SEQUENCE VALVE SQ: 600 psi
- **COATINGS:** POWDER POLYESTER EPOXY - LIGHT GRAY
- **COMPONENTS:**
  - A. PUMP 1.12 USGPM
  - B. MOTOR 1HP
  - C. SOLENOID VALVES
  - D. PRESSURE SWITCH
  - E. TEMP/LEVEL SWITCH
  - F. ACCUMULATOR (AC1), 60 CU. IN.
  - G. RAMP ACCUMULATOR (AC2), 15 CU.IN.
  - H. FILTER, 5 MICRON ABSOLUTE
  - J. FLOW THRU PORTING
- **APPROXIMATE WEIGHT:** 225 LB.
- **QUANTITY:** ONE

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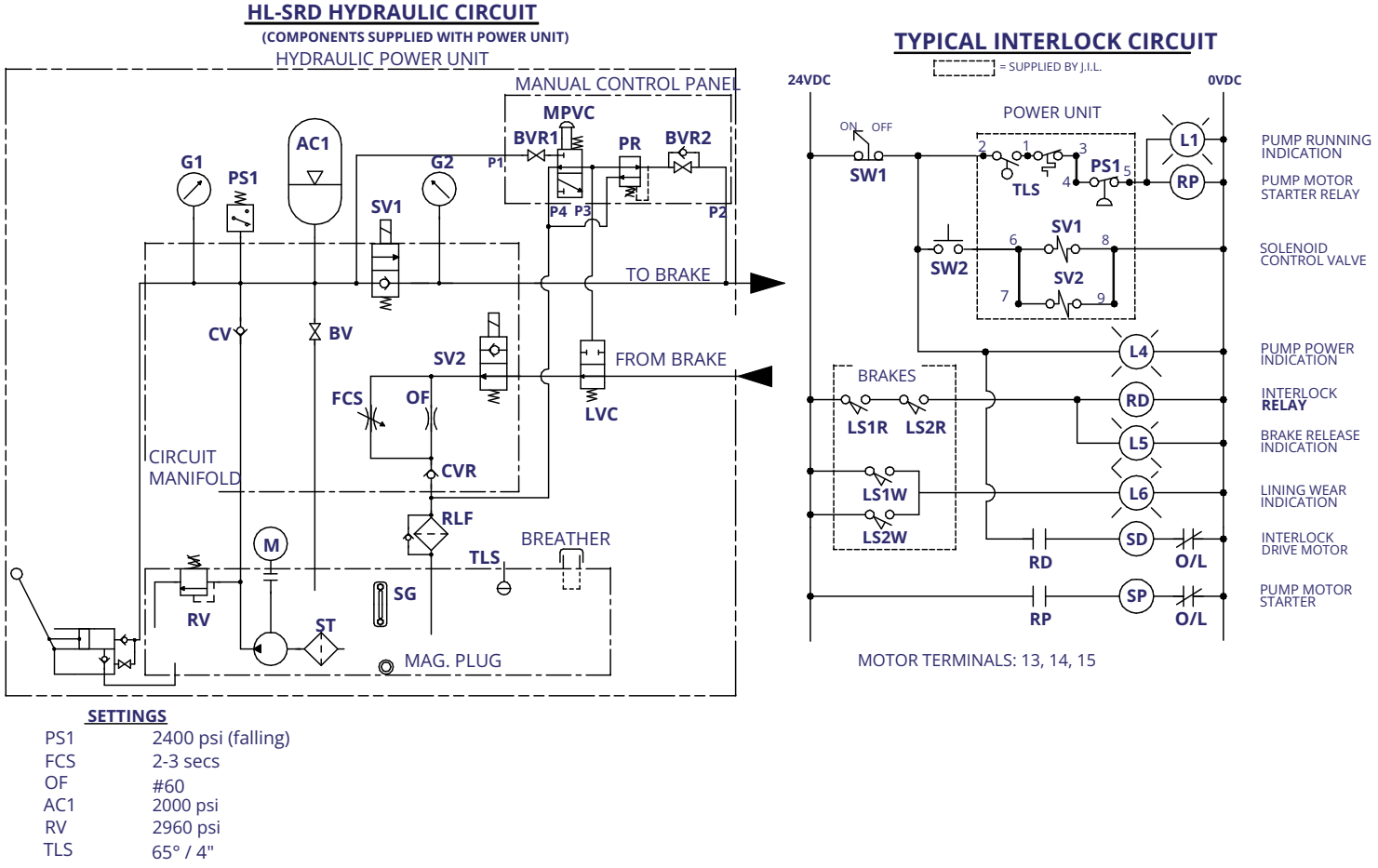
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HL112SRM Hydraulic Control Unit

Hydraulic / electrical schematic

DRAWING
B507508-11.0



SETTINGS

PS1	2400 psi (falling)
FCS	2-3 secs
OF	#60
AC1	2000 psi
RV	2960 psi
TLS	65° / 4"

Notes

- ACTUATION OF A SWITCHING DEVICE (SW1) STARTS THE PUMP AND PRECHARGES THE SYSTEM UNTIL PRESSURE SWITCH (PS) SHUTS OFF THE MOTOR PUMP. ACCUMULATOR (AC1) COMPENSATES FOR INTERNAL LEAKAGE AND PROVIDES A CHARGE OF OIL FOR RELEASING THE BRAKE BY MEANS OF (SW2) AND SOLENOID VALVES (SV1)(SV2). THE PUMP IS RESTARTED AND THE SYSTEM RECHARGES AS REQUIRED. IT MAY BE DISCHARGED MANUALLY TO TANK BY BLEED VALVE (BV). ACCUMULATOR (AC2) PROVIDES BACK PRESSURE FOR CONTROLLED BRAKING FORCE.

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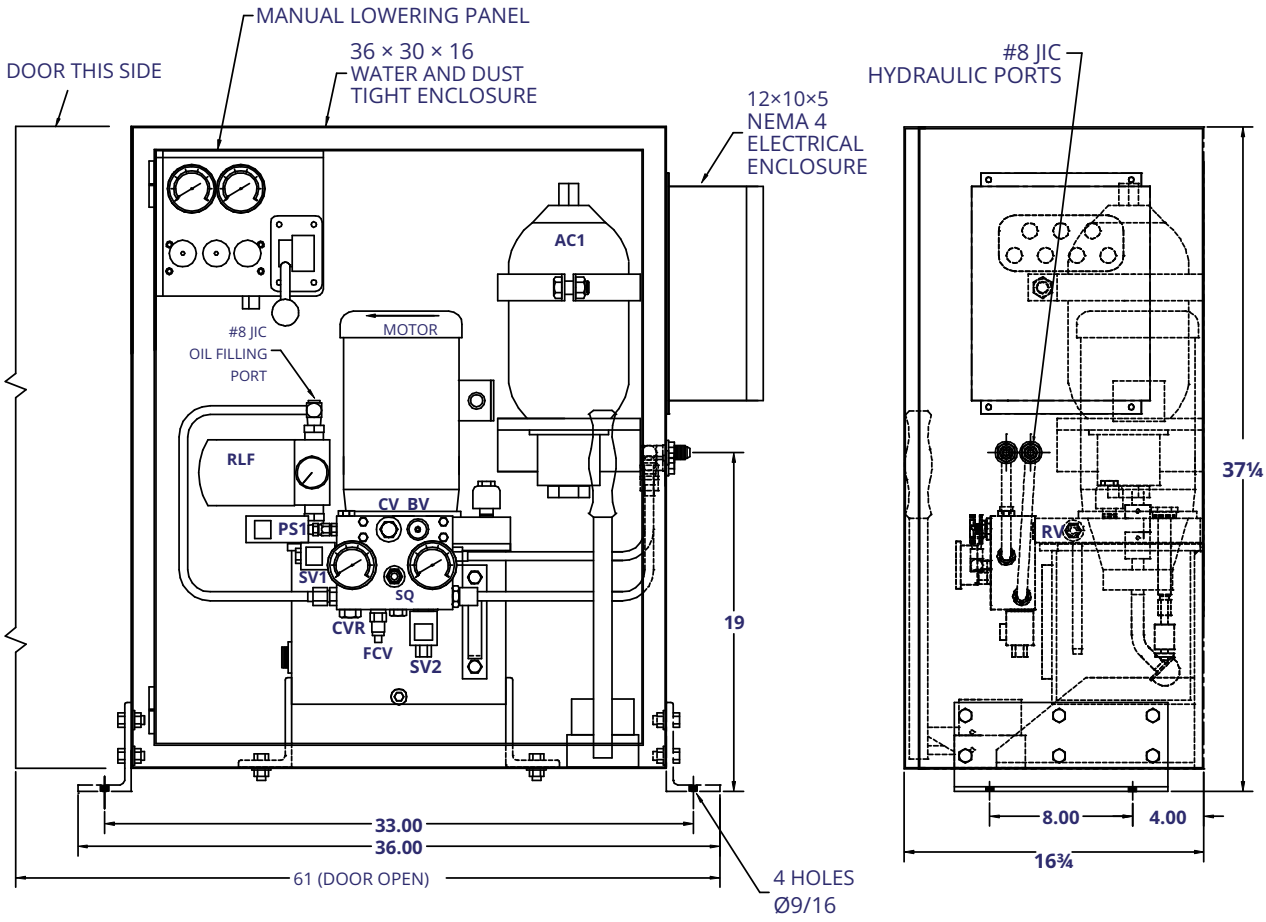
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HL112SRM Hydraulic Control Unit

Specification drawing

DRAWING
A5196-10.0



Notes

- **HYDRAULIC UNIT SPECIFICATIONS**
- **MODEL:** HL112SM - SOLENOID RELEASE/DUMP
- **APPLICATION:** CONTROL OF ONE DS2040 CALIPER BRAKE
- **REQUIRED HYDRAULIC LINE SIZE:**
  - OUTLET:
  - RETURN:
- **RECOMMENDED HYDRAULIC FLUID:** SHELL TELLUS T32
- **SETTINGS:**
  - A. N/A
  - B. PS1 SWITCH CUT-IN: 2400 psi
  - C. RELIEF: 2950 psi
  - D. ACCUMULATOR AC1: 2000 psi (Cold)
  - ACCUMULATOR AC2: N/A
- **COATINGS:** MACHINE ENAMEL (GRAY)
- **COMPONENTS:**
  - A. PUMP: 1.0 USGPM
  - B. MOTOR: 2HP
  - C. SOLENOID VALVES
  - D. PRESSURE SWITCH
  - E. TEMP/LEVEL SWITCH: 50VA
  - F. ACCUMULATOR: 230 CU. IN.
  - G. FILTER: 10 MICRON ABSOLUTE
  - H. RESERVOIR: 2.5 USG
- **APPROXIMATE WEIGHT:** 310 LB.
- **QUANTITY:**
- **OPTIONS:**
  - 0.6 cu.in. DOUBLE ACTING HAND PUMP
  - MANUAL LOWERING PANEL

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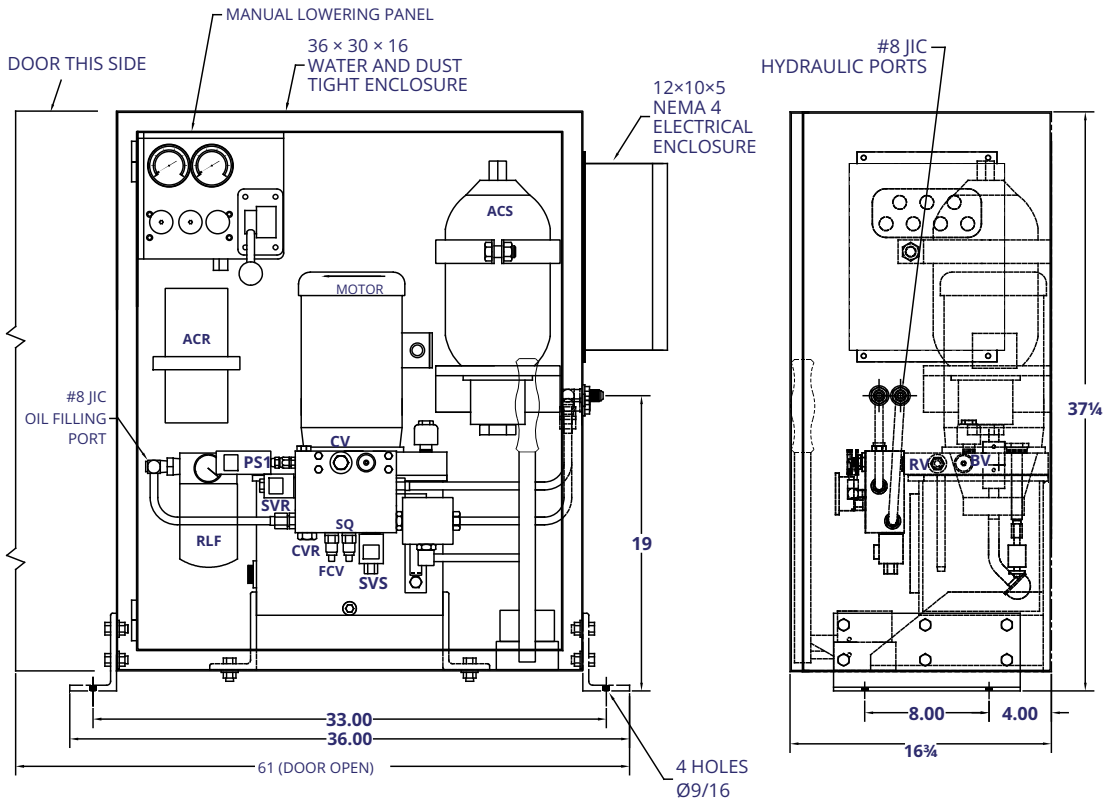
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HL112SRDM Hydraulic Control Unit

Specification drawing · manual lowering panel

DRAWING
A6029-10.0



Notes

- **HYDRAULIC UNIT SPECIFICATIONS**
- **MODEL:** HL112SRDM - SOLENOID RELEASE/DUMP
- **APPLICATION:** CONTROL OF ONE DS2040 CALIPER BRAKE
- **REQUIRED HYDRAULIC LINE SIZE:**
  - OUTLET: Ø1/2 - SCH 40
  - RETURN: Ø1/2 - SCH 40
- **RECOMMENDED HYDRAULIC FLUID:** ESSO UNIVIS HVI26
- **SETTINGS:**
  - A. PS1 SWITCH CUT-IN: 2400 psi
  - B. RELIEF: 2950 psi
  - C. ACCUMULATOR ACS: 2000 psi (Cold)
  - ACCUMULATOR ACR: 300 psi (Cold)
  - D. FLOW CONTROL FCS: 3 secs
  - E. HAND PUMP: 2600 psi
  - F. REGULATING VALVE: 0-1800 psi
  - G. SEQUENCE VALVE (SQ): 700 psi
- **COATINGS:** MACHINE ENAMEL (GRAY)
- **COMPONENTS:**
  - A. PUMP: 1.2 USGPM
  - B. MOTOR: 2HP/1725RPM/460V/3PH/60HZ/145TC
  - C. SOLENOID VALVES: 0.75A/24VDC
  - D. PRESSURE SWITCH: 24 VDC
  - E. TEMP/LEVEL SWITCH: 50VA
  - F. ACCUMULATOR: 230 CU. IN.
  - G. FILTER: 10 MICRON ABSOLUTE
  - H. RESERVOIR: 2.5 USG
- **APPROXIMATE WEIGHT:** 310 LB.
- **QUANTITY:** ONE(1)
- **OPTIONS:**
  - 0.6 cu.in. DOUBLE ACTING HAND PUMP
  - MANUAL LOWERING PANEL
  - 2 STAGE BRAKING
  - EXPLOSION PROOF MOTOR (RATED FOR 55°C AMBIENT TEMPERATURE)

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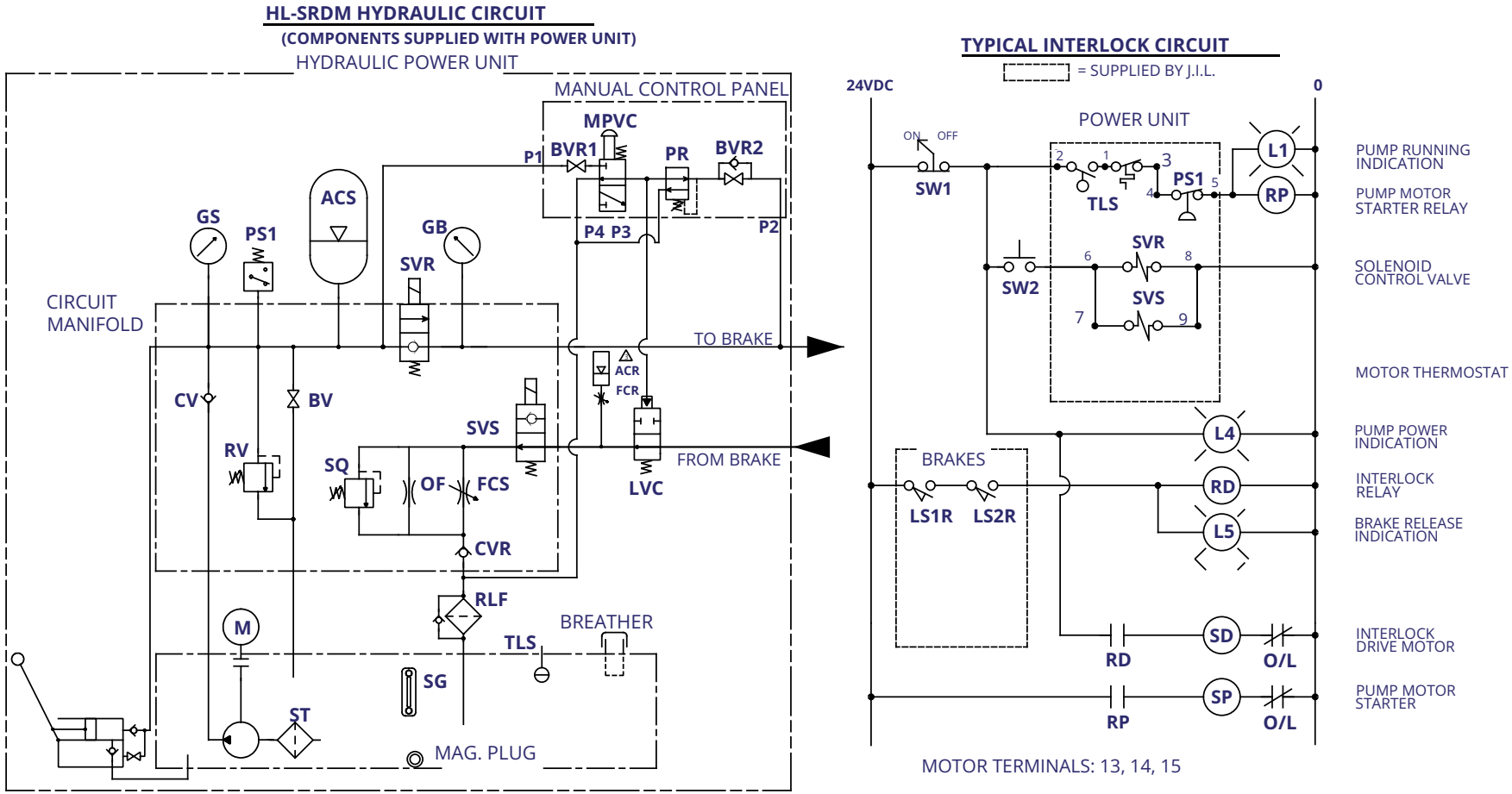
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HL112SRDM Hydraulic Control Unit

Hydraulic / electrical schematic

DRAWING
B6006-11.3



Notes

- ACTUATION OF A SWITCHING DEVICE (SW1) STARTS THE PUMP AND PRECHARGES THE SYSTEM UNTIL PRESSURE SWITCH (PS1) SHUTS OFF THE MOTOR PUMP. ACCUMULATOR (ACS) COMPENSATES FOR INTERNAL LEAKAGE AND PROVIDES A CHARGE OF OIL FOR RELEASING THE BRAKE BY MEANS OF (SW2) AND SOLENOID VALVES (SVR)(SVS). THE PUMP IS RESTARTED AND THE SYSTEM RECHARGES AS REQUIRED. IT MAY BE DISCHARGED MANUALLY TO TANK BY BLEED VALVE (BV).

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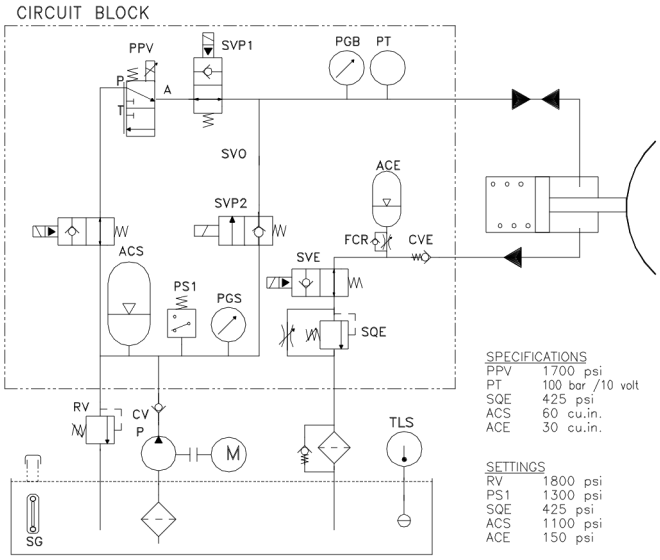
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HL112CLC Hydraulic Control Unit

Intelligent proportional brake controller

HL112CLC

HYDRAULIC CONTROL UNIT



- INTELLIGENT PROPORTIONAL BRAKE CONTROLLER
- SMOOTH & CONTROLLED BRAKING UNDER ALL LOAD CONDITIONS
- CONTINUOUS MONITORING DETECTS AND ALERTS ANY SYSTEM FAULTS
- PRE-PROGRAMMED & READY TO OPERATE FOR EASY IMPLEMENTATION
- NETWORK CAPABLE OPTION FOR COMMUNICATION WITH A MASTER PLC
- HYDRAULICS & ELECTRONICS ARE PROTECTED IN A NEMA 4 ENCLOSURE

The HL112CLC is the ideal brake controller for applications requiring close control over braking under all load conditions such as overland conveyors. The unit achieves this because it is intelligent; a high resolution shaft encoder is used for accurate speed sensing while a closed loop PID control program in the PLC determines the braking effort needed. This ensures that the braking application is monitored and adjusted continuously to provide a smooth stop. For an overland conveyor that means less damaging tension 'spikes' on the belt.

Because safe, reliable operation is so important this system has been programmed to perform continuous self diagnostic tests. For example, every time the brakes are released the controller tests the integrity of the brake torque springs. Should a fault be discovered a warning lamp is illuminated.

Installation is no problem; this system is a stand alone unit and is no more difficult to install than our conventional power units. The PLC and motor contactor are integral with the unit inside a NEMA 4 enclosure. All that is required is to make the electrical and plumbing connections plus install the shaft encoder. Furthermore, the system does not use a 'black box' - the controller is an industry common PLC and the program can be uploaded and traced on a lap top!

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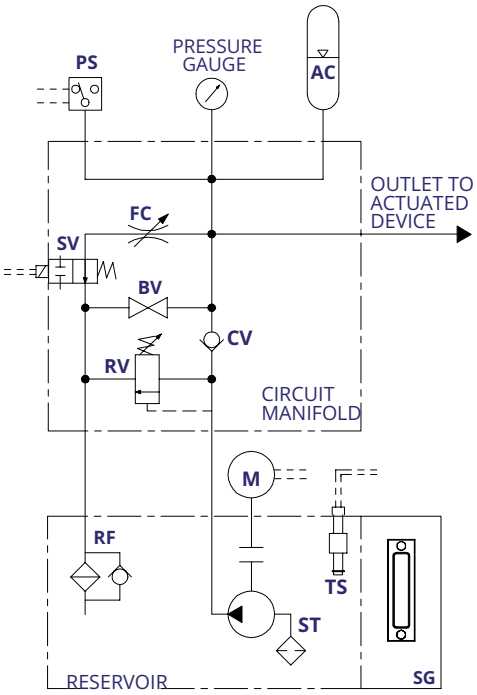
HU-SD Hydraulic Power Unit

Hydraulic & interlock circuits

DRAWING
HUSDC-01.0

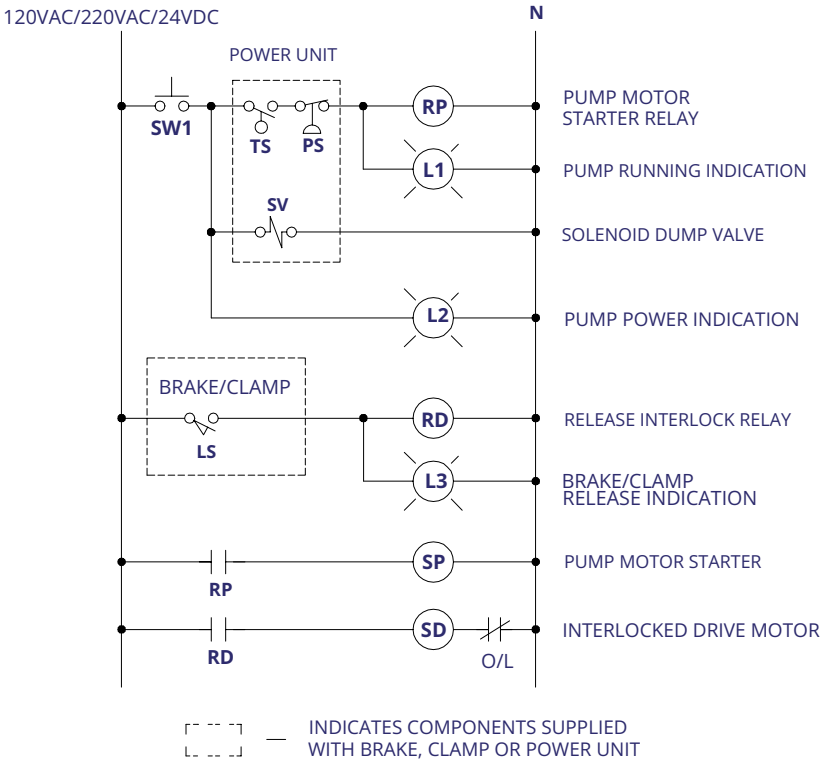
HU-SD HYDRAULIC CIRCUIT

(COMPONENTS SUPPLIED WITH POWER UNIT)



TYPICAL INTERLOCK CIRCUIT

(SOME COMPONENTS BY OTHERS)



LEGEND

AC - ACCUMULATOR
BV - BLEED VALVE
CV - CHECK VALVE
FC - BRAKE/CLAMP SET RATE CONTROL VALVE
L1 - PUMP RUNNING INDICATOR LIGHT
L2 - PUMP POWER INDICATOR LIGHT
L3 - BRAKE/CLAMP MODE INDICATOR LIGHT
LS - MODE INTERLOCK LIMIT SWITCH
M - PUMP MOTOR
O/L - DRIVE MOTOR OVERLOAD
PS - PRESSURE SWITCH
RD - BRAKE/CLAMP MODE INTERLOCK RELAY
RP - PUMP MOTOR STARTER RELAY
RV - RELIEF VALVE
SD - DRIVE MOTOR STARTER
SP - PUMP MOTOR STARTER
SG - LEVEL SIGHT GLASS
SV - SOLENOID DUMP VALVE
SW1 - DRIVE SWITCH
TS - TANK LEVEL SWITCH

Notes

- ACTUATION OF A SWITCHING DEVICE (SW) CLOSES (SV) AND OPERATES THE PUMP, ACTUATES A DEVICE AND CHARGES THE SYSTEM UNTIL PRESSURE SWITCH (PS) SHUTS OFF THE PUMP MOTOR. ACCUMULATOR (AC) COMPENSATES FOR INTERNAL LEAKAGE. WHEN (SW) IS OPENED OR A POWER FAILURE OCCURS, (SV) OPENS AND THE SYSTEM DISCHARGES TO TANK. THIS POWER UNIT REQUIRES A FEW MOMENTS TO ACTUATE A DEVICE AND IS INTENDED FOR USE WITH DEVICES SUCH AS SPRING-SET PRESSURE-RELEASED BRAKES WHICH ARE CYCLED INFREQUENTLY DURING PROLONGED OPERATING PERIODS WHEN PRESSURE IS REQUIRED.

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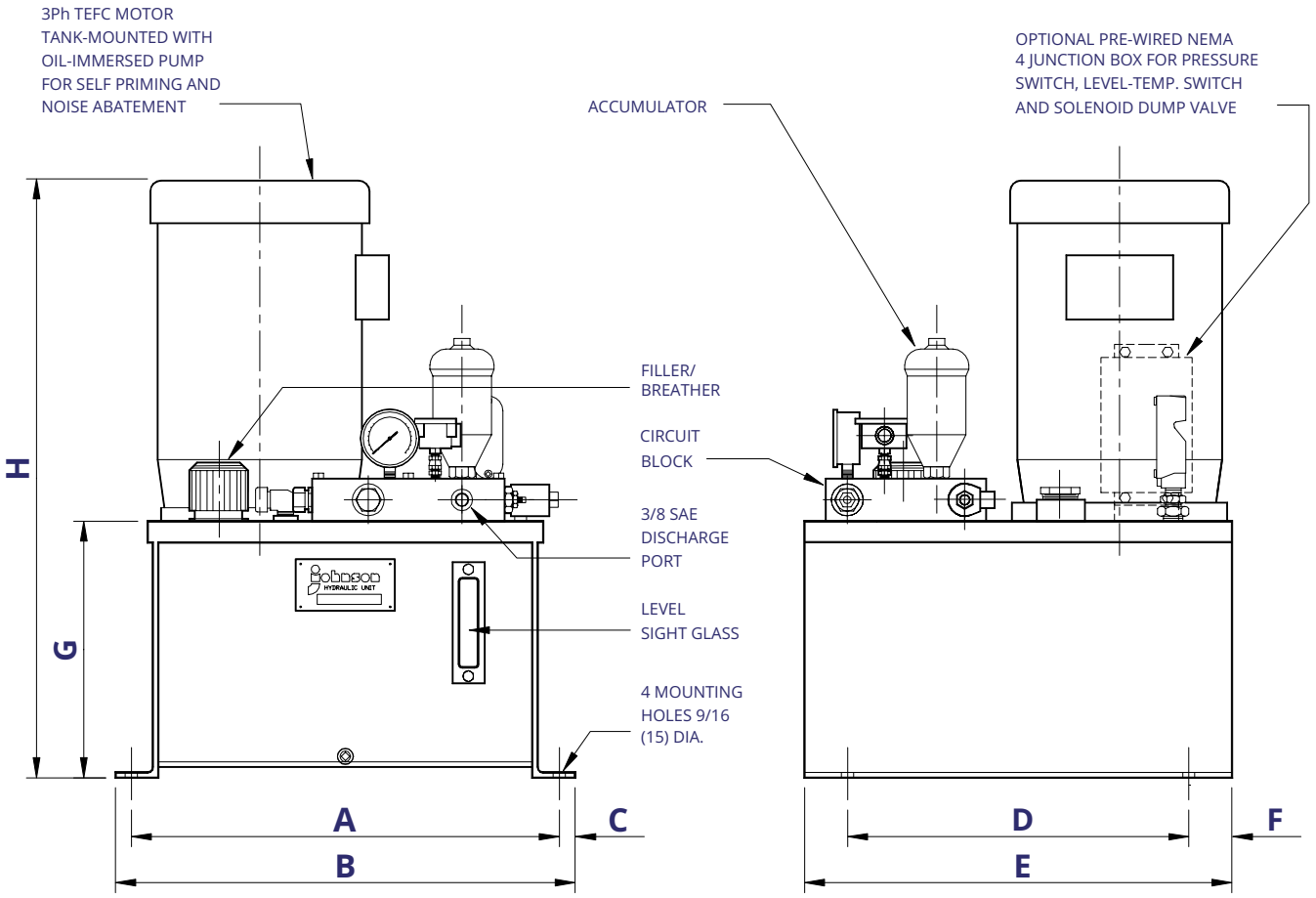
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HU-SD Hydraulic Power Unit (Solenoid Dump)

DRAWING
HUSDU-01.0



Specifications

Dual imperial / metric (usgpm/lpm, usg/l, hp/kw, in./mm, lb/kg)

- Motor mounted; 3Ph TEFC motor tank-mounted with oil-immersed pump for self priming and noise abatement
- Standard motors are 1725 RPM TEFC, 230/460 V 3PH 60 Hz and 380 V 3PH 50 Hz
- Weights are without oil in tank and with 3PH TEFC motor
- Optional pre-wired NEMA 4 junction box for pressure switch, level-temp. switch and solenoid dump valve
- Accumulator; filler/breather; circuit block; level sight glass
- Maximum operating pressures: 1200 PSI (8.27 MPa) continuous or 1500 PSI (10.34 MPa) intermittent
- 3/8 SAE discharge port; 4 mounting holes 9/16 in (15 mm) dia.

Model no.	Free flow usgpm/lpm	Tank capacity usg/l	Motor hp/kw	A	B	C	D	E	F	G	H	Weight lb/kg
HU015SD	1.14 / 4.32	6 / 23	1 / 0.75	16.25/413	17.5/445	0.625/16	13/330	16/406	1.5/38	9.25/235	25/635	242 / 110
HU022SD	1.70 / 6.44	6 / 23	1.5 / 1.12	16.25/413	17.5/445	0.625/16	13/330	16/406	1.5/38	9.25/235	25/635	246 / 112
HU029SD	2.21 / 8.37	6 / 23	2 / 1.49	16.25/413	17.5/445	0.625/16	13/330	16/406	1.5/38	9.25/235	28/711	252 / 115
HU043SD	3.28 / 12.42	6 / 23	3 / 2.24	16.25/413	17.5/445	0.625/16	13/330	16/406	1.5/38	9.25/235	28/711	270 / 123
HU073SD	5.56 / 21.05	12 / 45	5 / 3.73	20/508	21.5/546	0.75/19	16/406	20/508	2/51	12/305	N/A	470 / 168
HU116SD	8.84 / 33.47	12 / 45	7.5 / 5.59	20/508	21.5/546	0.75/19	16/406	20/508	2/51	12/305	N/A	410 / 187
HU155SD	11.81 / 44.71	12 / 45	10 / 7.45	20/508	21.5/546	0.75/19	16/406	20/508	2/51	12/305	N/A	435 / 198

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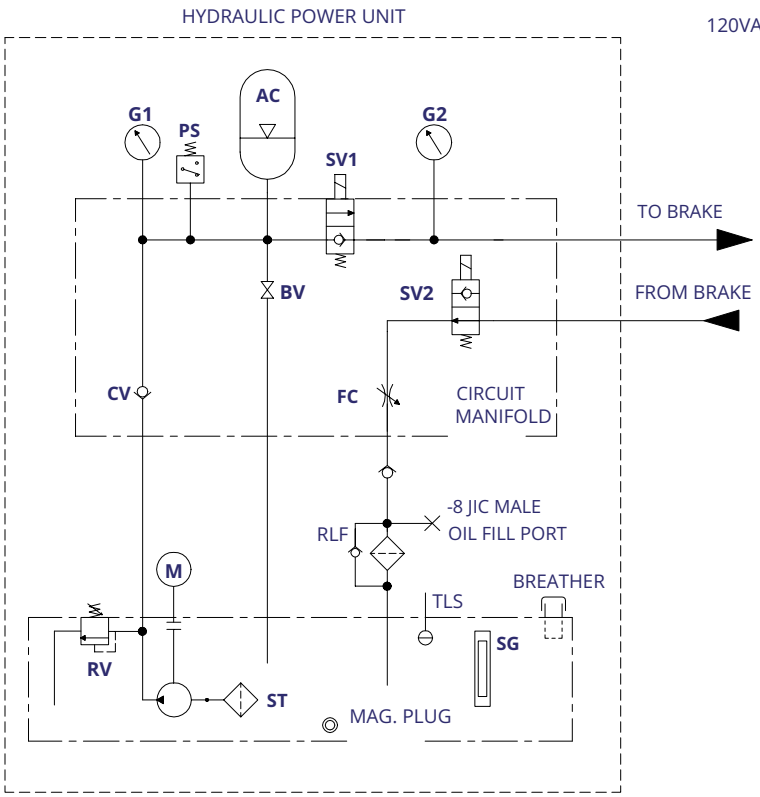
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HU-SR Hydraulic Power Unit

Hydraulic & interlock circuits

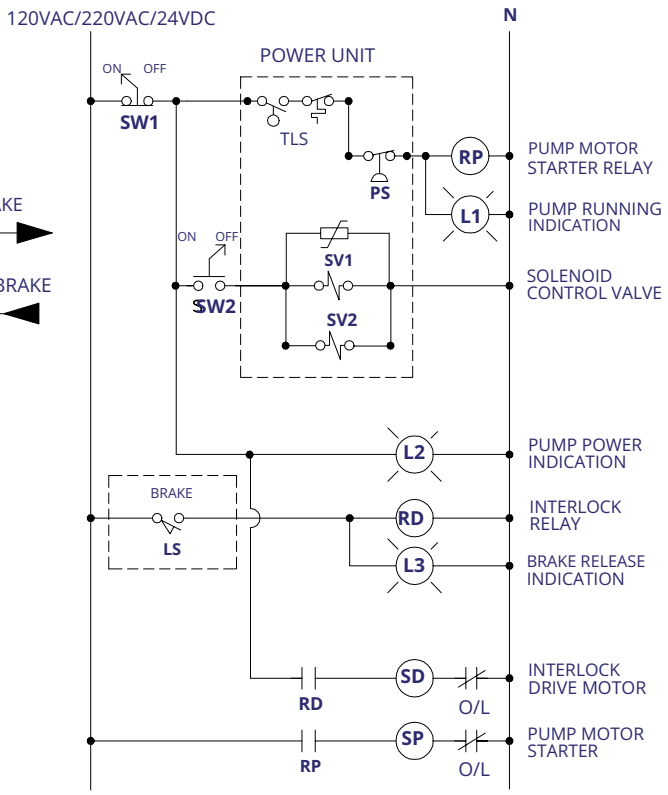
DRAWING
HUSRC-01.2

HU*SR HYDRAULIC CIRCUIT**
(COMPONENTS SUPPLIED WITH POWER UNIT)



TYPICAL INTERLOCK CIRCUIT

= SUPPLIED BY JOHNSON INDUSTRIES



LEGEND

AC - ACCUMULATOR
BV - BLEED VALVE
CV - CHECK VALVE
FC - BRAKE/CLAMP ACTUATION RATE CONTROL VALVE
L1 - PUMP RUNNING INDICATOR LIGHT
L2 - PUMP POWER INDICATOR LIGHT
L3 - BRAKE/CLAMP MODE INDICATOR LIGHT
LS - MODE INTERLOCK LIMIT SWITCH
M - PUMP MOTOR
O/L - DRIVE MOTOR OVERLOAD
PS - PRESSURE SWITCH
RD - BRAKE/CLAMP MODE INTERLOCK RELAY
RP - PUMP MOTOR STARTER RELAY
RV - RELIEF VALVE
SD - DRIVE MOTOR STARTER
SP - PUMP MOTOR STARTER
SG - LEVEL SIGHT GLASS
SV1,SV2 - SOLENOID DUMP VALVE
SW1 - DRIVE SWITCH
TLS - TEMPERATURE/LEVEL SWITCH

Notes

- ACTUATION OF A SWITCHING DEVICE (SW1) STARTS THE PUMP AND PRECHARGES THE SYSTEM UNTIL PRESSURE SWITCH (PS) SHUTS OFF THE PUMP MOTOR. ACCUMULATOR (AC) COMPENSATES FOR INTERNAL LEAKAGE AND PROVIDES A CHARGE OF OIL FOR RELEASING THE BRAKE BY MEANS OF (SW2) AND SOLENOID VALVES (SV1)(SV2). THE PUMP IS RESTARTED AND THE SYSTEM RECHARGES AS REQUIRED. IT MAY BE DISCHARGED MANUALLY TO TANK BY BLEED VALVE (BV). FLOW CONTROL VALVE (FC) REGULATES THE BRAKE SETTING TIME.

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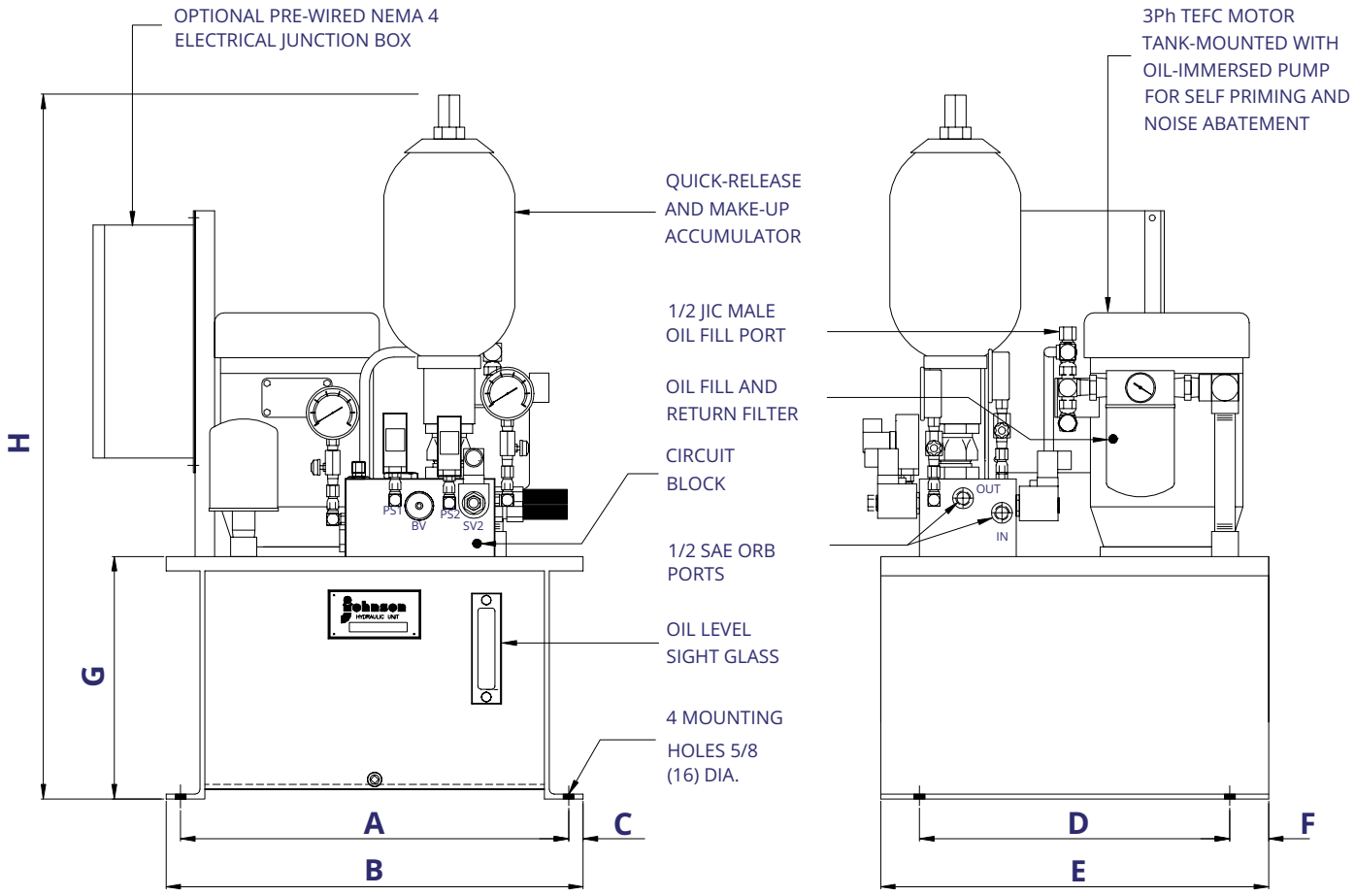
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HU-SR Hydraulic Power Unit (Solenoid Release)

DRAWING
HUSRU-01.1



Specifications

Dual imperial / metric (usgpm/lpm, usg/l, hp/kw, in./mm, lb/kg)

- Motor mounted; 3Ph TEFC motor tank-mounted with oil-immersed pump for self priming and noise abatement
- Standard motors are 1725 RPM TEFC, 230/460 V 3PH 60 Hz and 380 V 3PH 50 Hz
- Weights are without oil in tank and with 3PH TEFC motor
- Optional pre-wired NEMA 4 junction box for pressure switch, level-temp. switch and solenoid dump valve
- Accumulator; filler/breather; circuit block; level sight glass
- Maximum operating pressures: 1800 PSI (12.41 MPa) continuous or 2000 PSI (13.79 MPa) intermittent
- Quick-release and make-up accumulator; 1/2 JIC male oil fill port; oil fill and return filter
- 1/2 SAE ORB ports; oil level sight glass; 4 mounting holes 5/8 in (16 mm) dia.

Model no.	Free flow usgpm/lpm	Tank capacity usg/l	Motor hp/kw	A	B	C	D	E	F	G	H	Weight lb/kg
HU015SR	1.12 / 4.24	15 / 56	1.5 / 1.12	20/508	21.5/546	0.75/19	16/406	20/508	2/51	12.5/318	36.5/927	310 / 141
HU024SR	1.79 / 6.77	15 / 56	2 / 1.49	20/508	21.5/546	0.75/19	16/406	20/508	2/51	12.5/318	36.5/927	315 / 143
HU030SR	2.24 / 8.48	15 / 56	3 / 2.24	20/508	21.5/546	0.75/19	16/406	20/508	2/51	12.5/318	40.5/1029	322 / 146
HU038SR	2.84 / 10.75	15 / 56	3 / 2.24	20/508	21.5/546	0.75/19	16/406	20/508	2/51	12.5/318	40.5/1029	335 / 152

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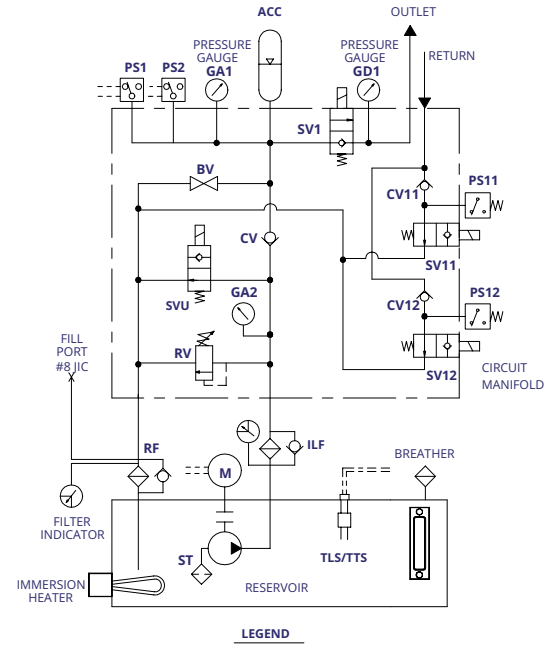
HU043SR Hydraulic Unit

Hydraulic & interlock circuits

DRAWING
HU043SRC-11.1

HU043SR HYDRAULIC CIRCUIT

(COMPONENTS SUPPLIED WITH POWER UNIT)

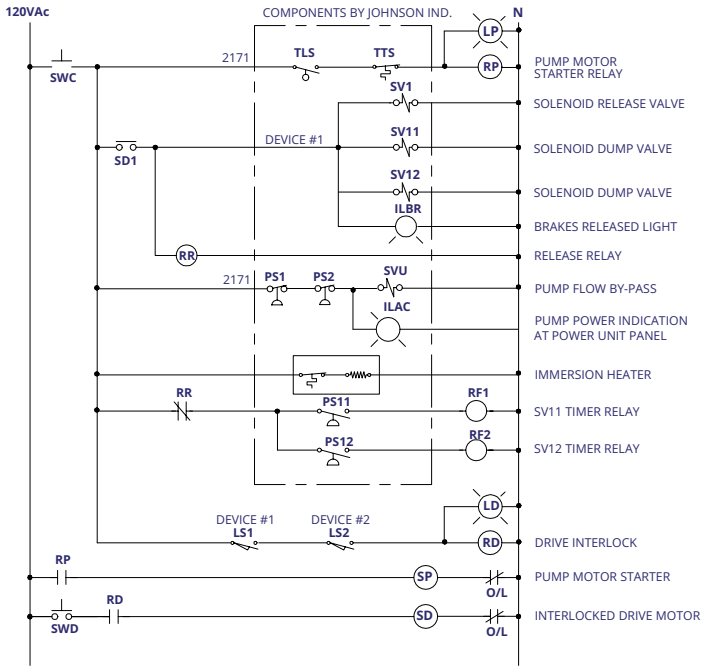


LEGEND

ACC- ACCUMULATOR
BV - BLEED VALVE
CV - CHECK VALVE
LP - PUMP RUNNING INDICATOR LIGHT
LU - PUMP POWER INDICATOR LIGHT
LD - BRAKE/CLAMP MODE INDICATOR LIGHT
LS1 & LS2 - MODE INTERLOCK LIMIT SWITCH
M - PUMP MOTOR
O/L- MOTOR OVERLOAD
PS1 - PRESSURE SWITCH
PS2 - PRESSURE SWITCH
RP - PUMP MOTOR STARTER RELAY
RV - RELIEF VALVE
SD - DRIVE MOTOR STARTER
SP - PUMP MOTOR STARTER
SG - LEVEL SIGHT GLASS
SVU - SOLENOID BY-PASS VALVE
SV1 & SV2 - SOLENOID RELEASE VALVE
SV11 & SV12 - FIRST DEVICE SOLENOID VALVE
SWC - MAIN CONTROL SWITCH
SWD - CONTROLLED DRIVE SWITCH
SD1 - FIRST DEVICE CONTROL SWITCH
TEMP/LEVEL SWITCH

TYPICAL INTERLOCK CIRCUIT

(SOME COMPONENTS BY OTHERS)



Notes

- ACTUATION OF A SWITCHING DEVICE (SWC) STARTS THE PUMP AND PRECHARGES THE SYSTEM UNTIL PUMP BY-PASS VALVE (SVU) DIRECTS PUMP FLOW TO TANK. THE PUMP OPERATES CONTINUOUSLY UNTIL POWER IS REMOVED. ACTIVATING (SD1) DIRECTS OIL FROM THE ACCUMULATOR ACC TO THE FIRST OF TWO ACTUATED DEVICES. (SD2) DIRECTS OIL TO A SECOND DEVICE. REDUNDANT SOLENOID VALVES ENSURE DEVICE RETURN AND REDUNDANT PRESSURE SWITCHES PROTECT THE HYDRAULIC PUMP. THIS POWER UNIT FEATURES A SIMPLIFIED INTERLOCK CIRCUIT, FAST ACTUATION OF A DEVICE, AND IS INTENDED FOR USE WITH SUCH DEVICES AS SPRING-SET PRESSURE-RELEASED BRAKES WHICH ARE CYCLED FREQUENTLY.

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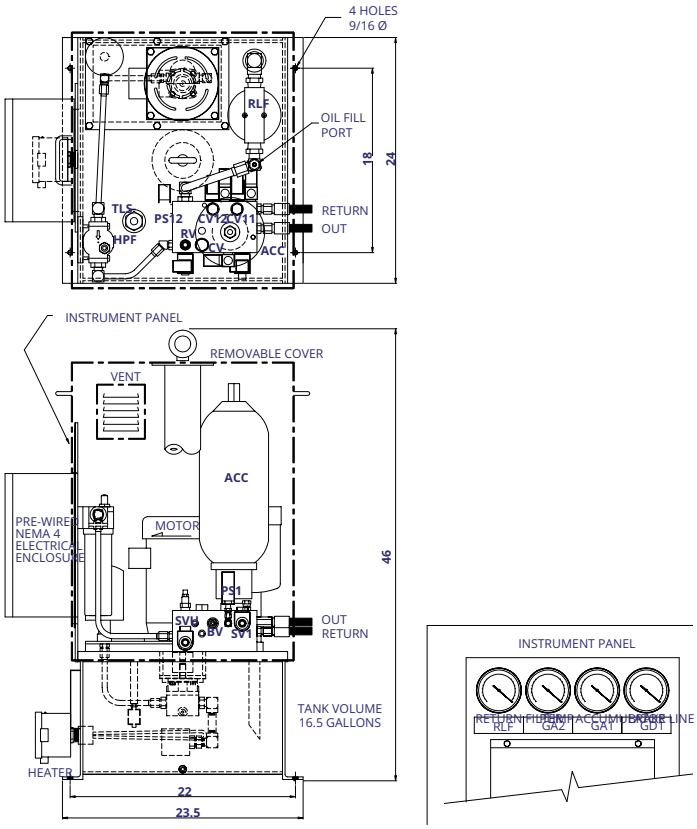
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HU043SR Hydraulic Power Unit

Specification drawing

DRAWING
HU043SRD-1.0



Notes

- **HYDRAULIC UNIT SPECIFICATIONS**
- **MODEL:** HU043SR - SOLENOID RELEASE
- **APPLICATION:** TO CONTROL BRAKING DEVICES
- **RECOMMENDED HYDRAULIC LINE SIZE:**
  - MAIN LINE: 3/4" I.D.
  - BRANCH LINE: 1/2" I.D.
- **RECOMMENDED HYDRAULIC FLUID:** PETRO-CANADA HARMONY 32
- **PRESSURE SETTINGS:**
  - A. PRESSURE SWITCH PS1 (NC) / PS2 (NC) OPEN @ 1925 PSI (INCREASING)
  - B. PRESSURE SWITCH PS11 (NO) / PS12 (NO) OPEN @ 300 PSI (DECREASING)
  - C. RELIEF 2250 PSI
  - D. ACCUMULATOR PRECHARGE 1100 PSI
- **COATINGS:**
  - ONE COAT ALKYD PRIMER
  - ONE COAT ENAMEL PAINT - J.I.L. GRAY
- **COMPONENTS:**
  - A. PUMP 2.4 U.S.G.P.M.
  - B. ACCUMULATOR 2.5 U.S.G.
  - C. MOTOR 3HP/1725RPM/460V/3Ø/60HZ/TEFC
  - D. SOLENOID VALVE 110VAC/.08AMP
  - E. PRESSURE SWITCH 110VAC/5AMP
  - F. TEMP/LEVEL SWITCH 110VAC/3AMP
  - G. IMMERSION HEATER 110VAC/1000WATT
- **APPROXIMATE WEIGHT:** 450 LB / UNIT
- **QUANTITY:** (1) ONE
- **INCLUDE OPTIONS:**
  - RETURN FILTER WITH INDICATOR
  - SIGHT GLASS WITH THERMOMETER
  - LOW OIL LEVEL SWITCH
  - OIL FILL CAP
  - IMMERSION HEATER
  - RAIN COVER FOR MOTOR

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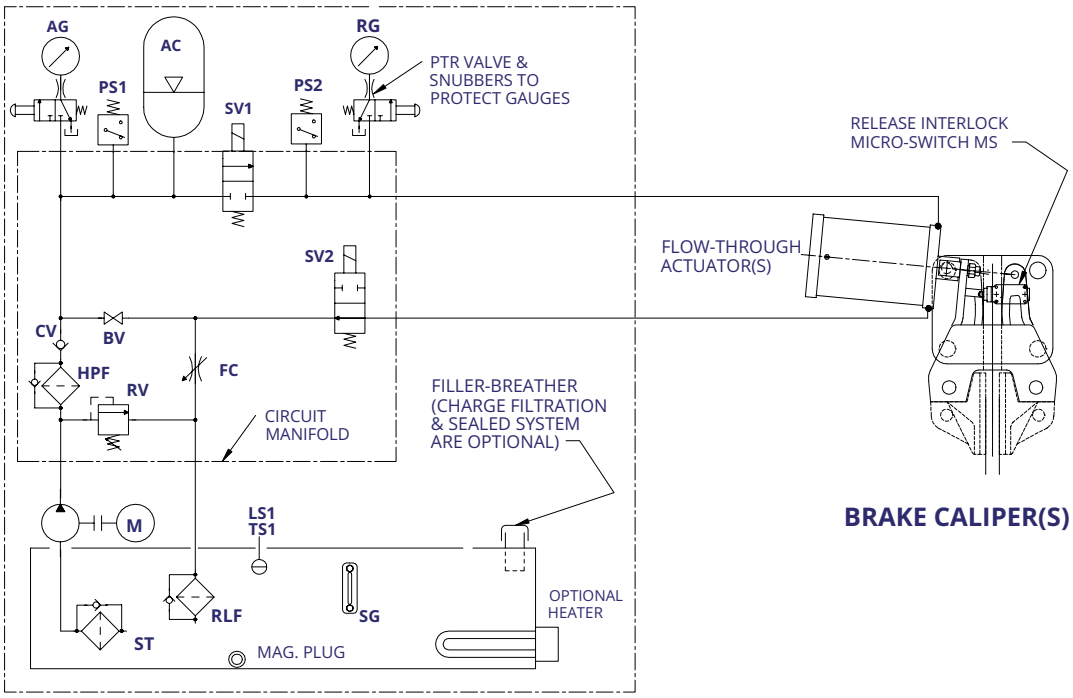
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Disc Brake Release/Set Controls

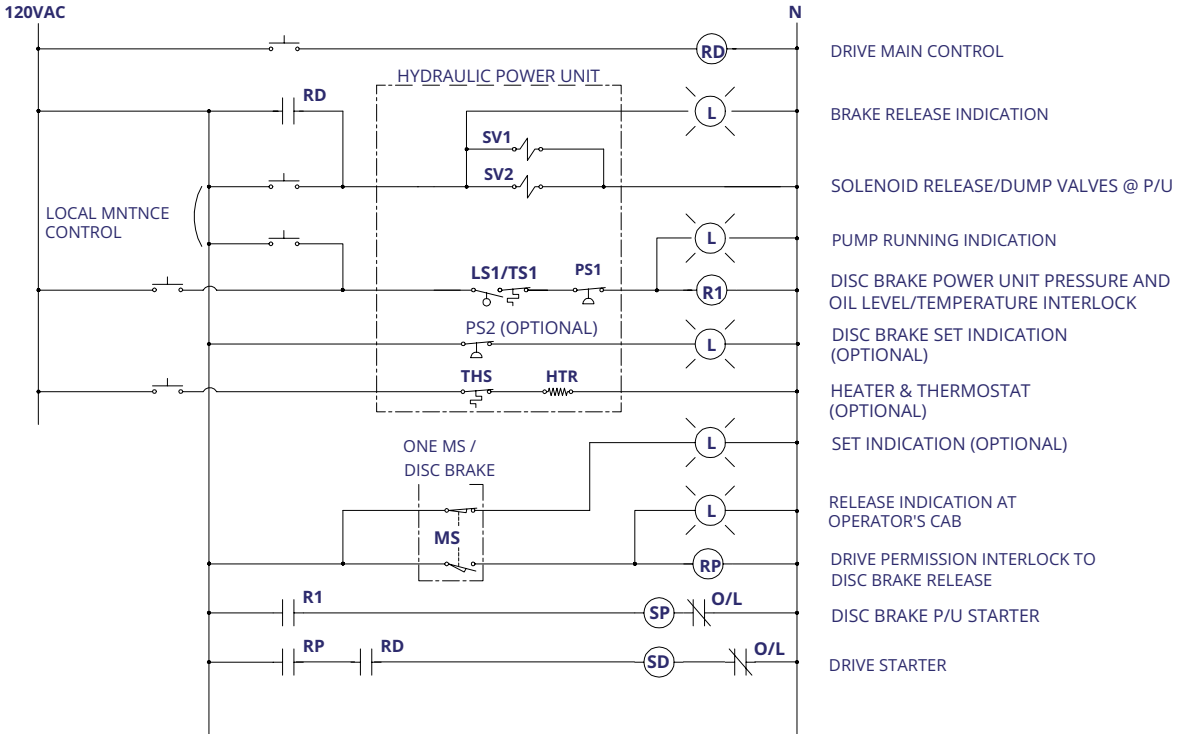
Spring-set, hydraulic pressure release · quick-release accumulator, flow-through actuator(s)

DRAWING
DBC01-1.0

HYDRAULIC POWER UNIT



TYPICAL ELECTRICAL CONTROLS & LOGIC



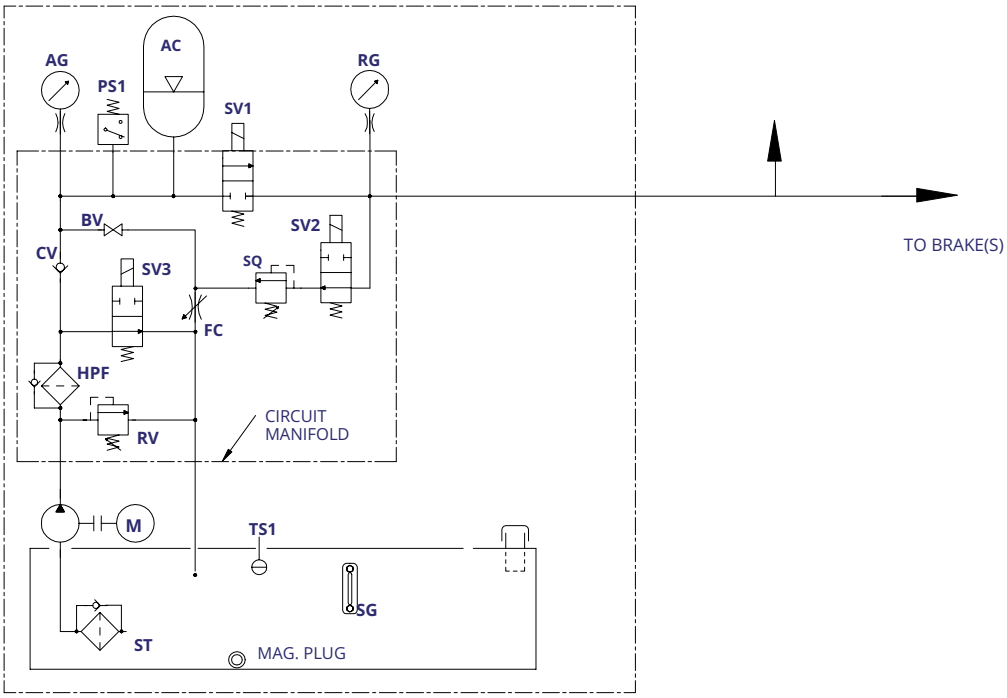
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Disc Brake Release/Set Controls

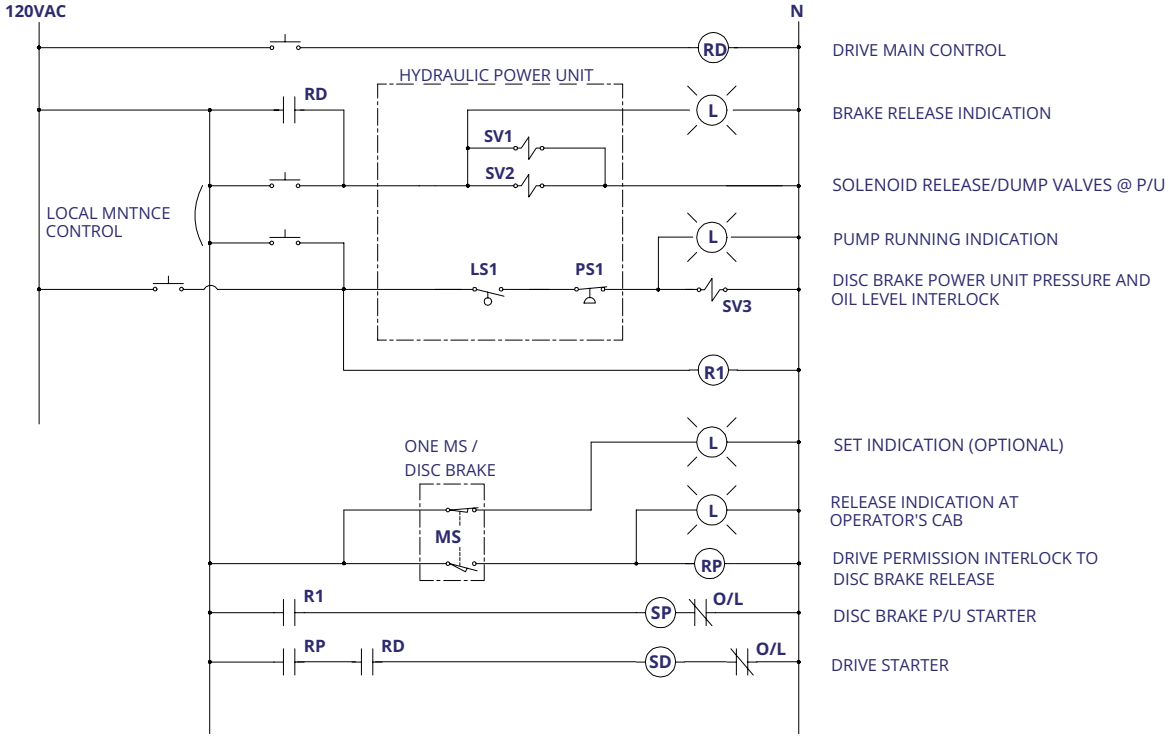
Spring-set, hydraulic pressure release · quick-release accumulator

DRAWING
DBC02-1.1

HYDRAULIC POWER UNIT



TYPICAL ELECTRICAL CONTROLS & LOGIC



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JIL Eastern Division
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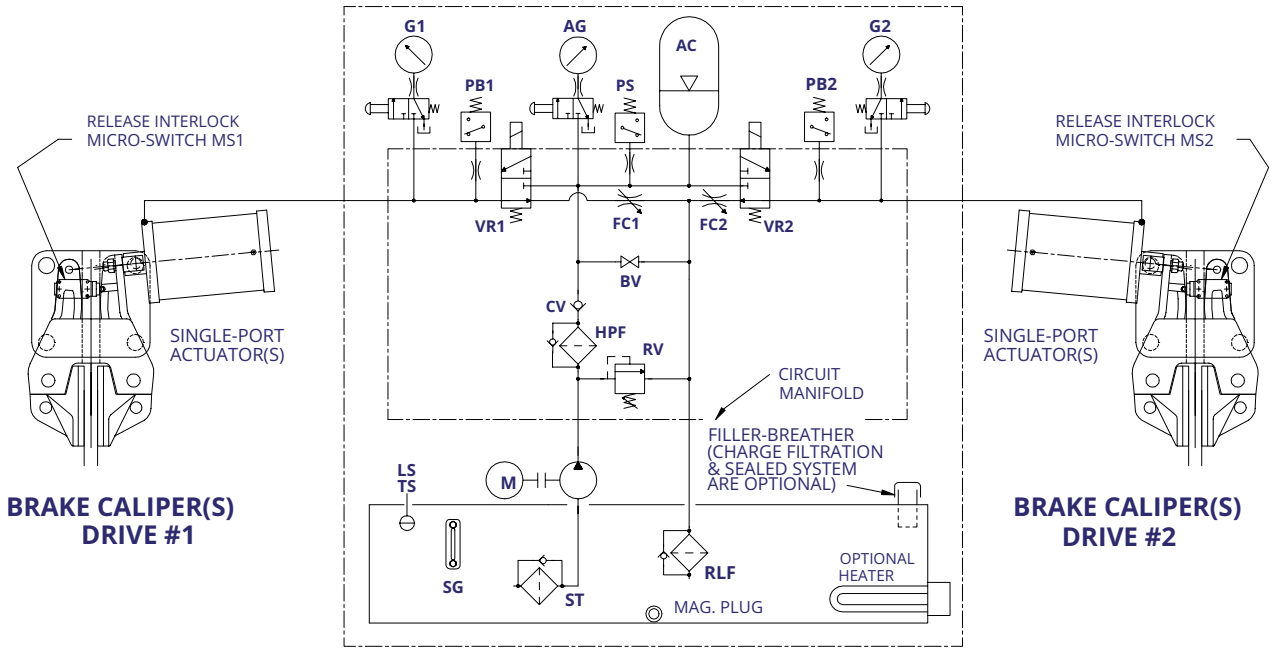
Johnson Elevanja Ltd.
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Tel: +44 (0)1278 456411

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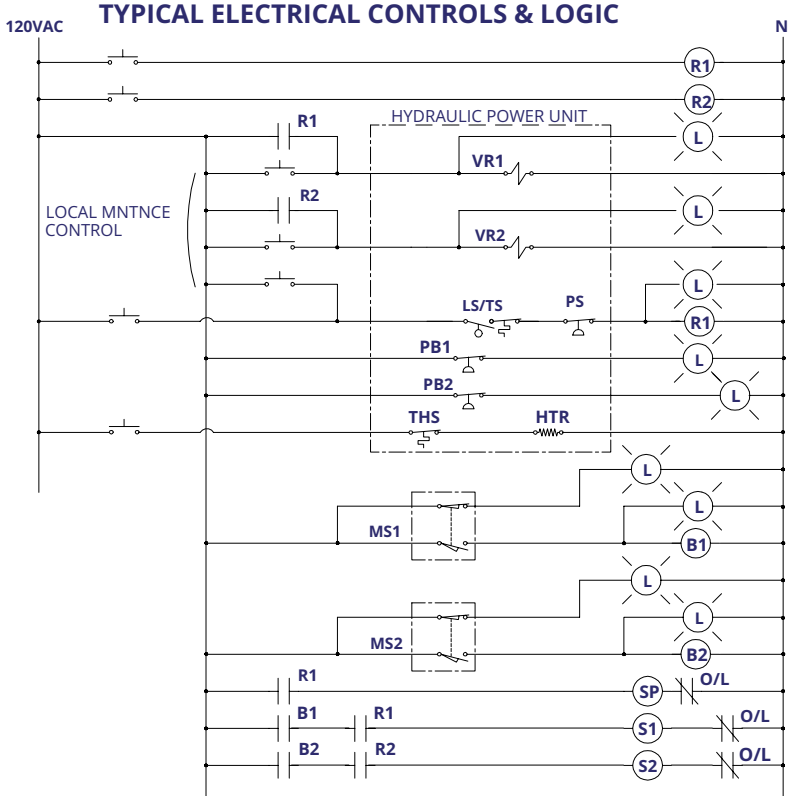
Dual Disc Brake Release/Set Controls

Quick-release accumulator · single-port actuator(s)

DRAWING
DBC03-1.0



TYPICAL ELECTRICAL CONTROLS & LOGIC



DRIVE #1 MAIN CONTROL
DRIVE #2 MAIN CONTROL
BRAKE RELEASE INDICATION, DRIVE #1
SOLENOID RELEASE/DUMP VALVES @ P/U
BRAKE RELEASE INDICATION, DRIVE #2
SOLENOID RELEASE/DUMP VALVES @ P/U
PUMP RUNNING INDICATION
DISC BRAKE POWER UNIT PRESSURE AND OIL LEVEL/TEMPERATURE INTERLOCK
DISC BRAKE SET INDICATION (OPTIONAL)
DISC BRAKE SET INDICATION (OPTIONAL)
HEATER & THERMOSTAT (OPTIONAL)
SET INDICATION (OPTIONAL)
RELEASE INDICATION AT OPERATOR'S CAB
DRIVE PERMISSION INTERLOCK TO DISC BRAKE RELEASE
SET INDICATION (OPTIONAL)
RELEASE INDICATION AT OPERATOR'S CAB
DRIVE PERMISSION INTERLOCK TO DISC BRAKE RELEASE
DISC BRAKE P/U STARTER
#1 DRIVE STARTER
#2 DRIVE STARTER

02

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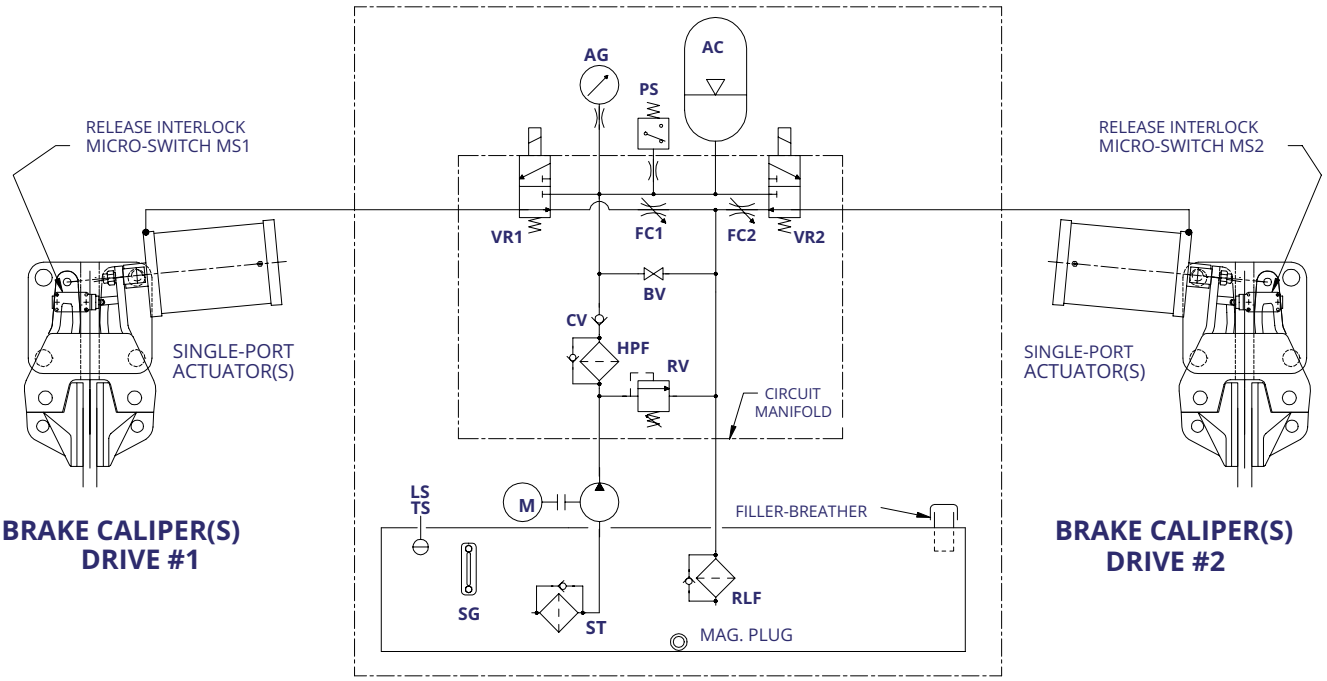
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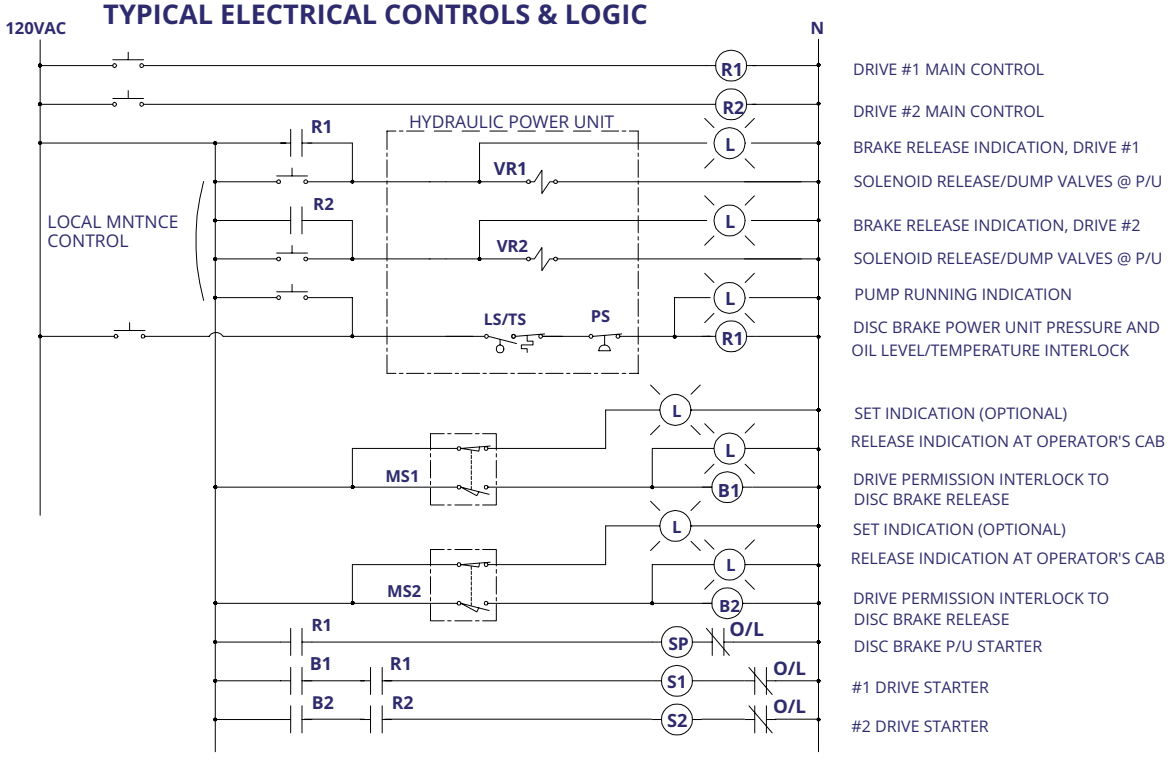
Dual Disc Brake Release/Set Controls

Quick-release accumulator · single-port actuator(s)

DRAWING
DBC04-1.0



TYPICAL ELECTRICAL CONTROLS & LOGIC



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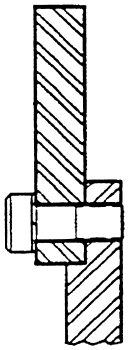
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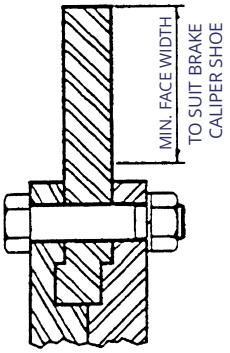
Typical Disc Mounting Methods

Solid and ventilated discs

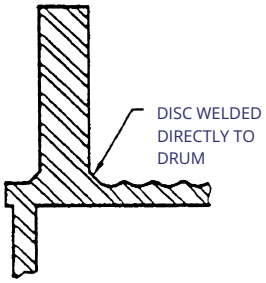
DRAWING
DMM01-1.0



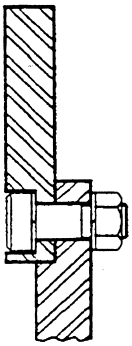
SPIGOT MOUNT
C'BORED HOLES IN DISC

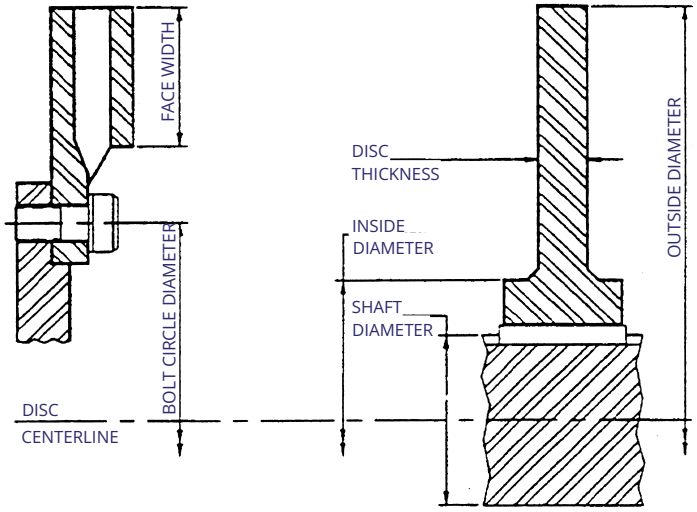


SPIGOT MOUNT
VENTILATED DISC

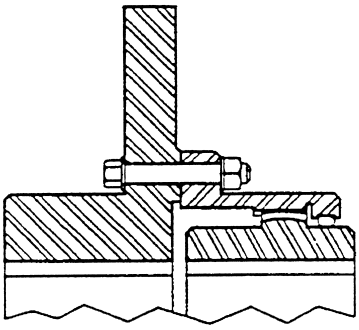


HUB MOUNT
SOLID OR TAPER-LOCK

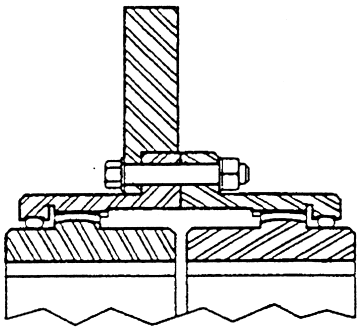




SINGLE GEAR COUPLING
CUSTOM COUPLING HALF MOUNTED
ON DRIVEN SHAFT



DOUBLE GEAR COUPLING
SPIGOTTED DISC MOUNTED ON



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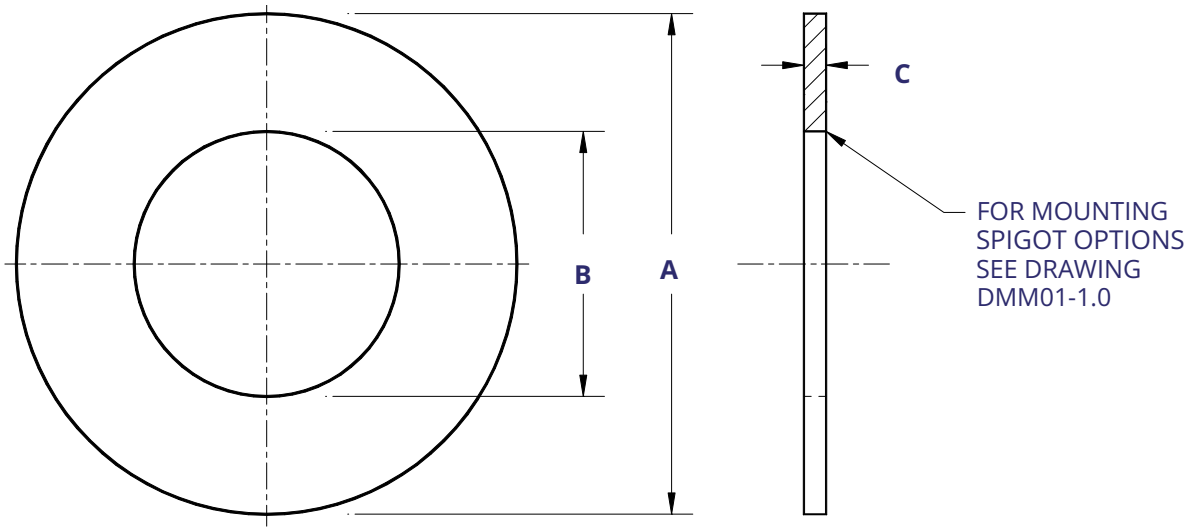
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Plain Solid Steel Disc Properties

800/1000/1800/2000/2800/3000/3800/4000 calipers

DRAWING
DMM02-1.0



DISC NO.	ENERGY CAPACITY		WEIGHT	WK²	DIMENSIONS - in./mm		
	HEAT SINK hp-sec. kW-sec.	CONTINUOUS hp kW	lb kg	lb-ft² kg-m²	A	B	C
15075R	1609 1200	1.9 1.4	31 14	7 0.3	15 381	6 152	0.75 19.1
25075R	2897 2160	3.4 2.6	61 28	47 2.0	25 635	16 406	0.75 19.1
25125R	7210 5376	5.2 3.9	145 66	91 3.8	25 635	10 254	1.25 31.8
35125R	10643 7936	7.6 5.7	227 103	321 13.5	35 889	20 508	1.25 31.8
30175R	17303 12903	8.7 6.5	260 118	254 10.7	30 762	15 381	1.75 44.5
40175R	24512 18279	12.4 9.2	376 171	726 30.7	40 1016	25 635	1.75 44.5
50175R	31722 23655	16.0 11.9	492 224	1590 67.2	50 1270	35 889	1.75 44.5
35200R	26916 20071	11.8 8.8	364 165	513 21.7	35 889	20 508	2.00 50.8
45200R	36528 27239	16.1 12.0	496 225	1259 53.2	45 1143	30 762	2.00 50.8
55200R	46141 34407	20.3 15.1	628 286	2522 106.5	55 1397	40 1016	2.00 50.8

Notes

- **NOTE:**
  - Disc maximum temperature is 500°F / 260°C above ambient
  - Heat sink capacity is based on one brake application for 60 sec.
  - Continuous heating capacity is based on 100 RPM

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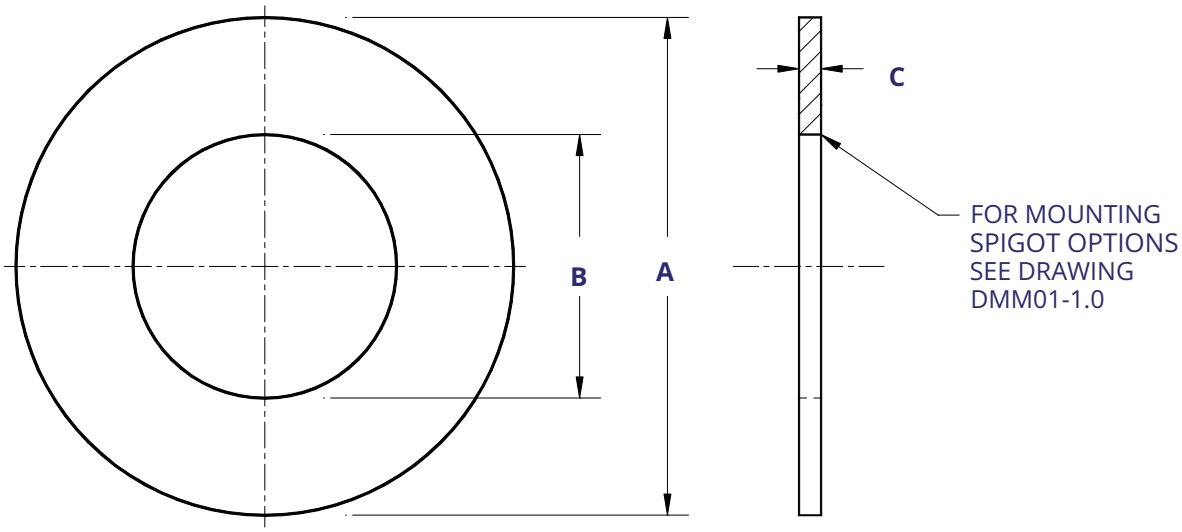
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Plain Solid Steel Disc Properties

2800X/3000X/4800/5000/5800/6000 calipers

DRAWING
DMM03-1.0



DISC NO.	ENERGY CAPACITY		WEIGHT	WK²	DIMENSIONS - in./mm		
	HEAT SINK hp-sec. kW-sec.	CONTINUOUS hp kW	lb kg	lb-ft² kg-m²	A	B	C
30100R	9887 7373	7.9 5.9	155 71	148 6.2	30 762	14 356	1.00 25.4
35100R	13458 10036	10.5 7.8	190 87	262 11.1	35 889	19 483	1.00 25.4
40100R	17578 13108	13.5 10.1	226 103	426 18.0	40 1016	24 610	1.00 25.4
45100R	20324 15156	15.6 11.7	261 119	649 27.4	45 1143	29 737	1.00 25.4
50100R	23071 17204	17.8 13.2	296 135	940 39.7	50 1270	34 864	1.00 25.4
55113R	29044 21658	20.2 15.0	373 170	1472 62.2	55 1397	39 991	1.13 28.6
60113R	32134 23962	22.3 16.6	413 188	1983 83.8	60 1524	44 1118	1.13 28.6
65113R	35224 26266	24.4 18.2	452 206	2601 109.9	65 1651	49 1245	1.13 28.6
70113R	38314 28570	26.6 19.8	492 224	3338 141.0	70 1778	54 1372	1.13 28.6
75113R	41403 30875	28.7 21.4	532 242	4202 177.5	75 1905	59 1499	1.13 28.6

Notes

- **NOTE:**
  - Disc maximum temperature is 500°F / 260°C above ambient
  - Heat sink capacity is based on one brake application for 60 sec.
  - Continuous heating capacity is based on 100 RPM

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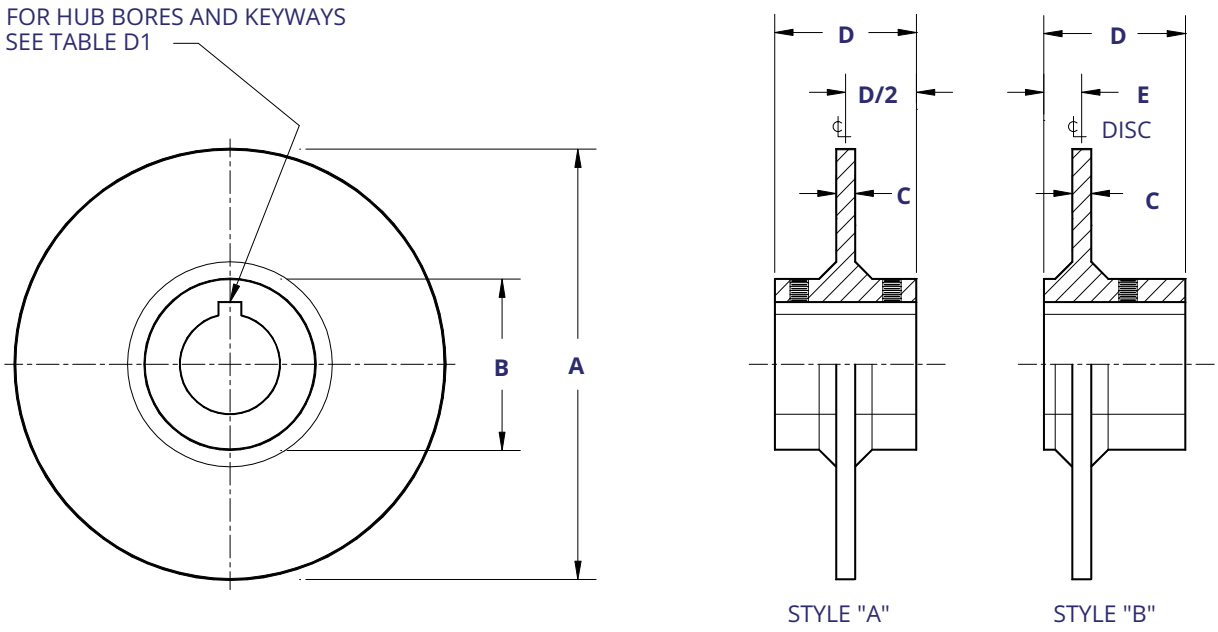
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Hubbed Solid Steel Disc Properties

800/1000/1800/2000/2800/3000/3800/4000 calipers

DRAWING
DMM04-1.0



DISC NO.	ENERGY CAPACITY		WEIGHT	WK²	DIMENSIONS - in./mm				
	HEAT SINK hp-sec. kW-sec.	CONTINUOUS hp kW	lb kg	lb-ft² kg-m²	A	B	C	D	E
15075H	2781 2074	2.9 2.2	41 18	7 0.3	15 381	3.25 82.6	0.75 19.1	3.0 76.2	1.5 38.1
25075H	6489 4839	7.4 5.5	117 53	56 2.4	25 635	4.50 114.3	0.75 19.1	5.0 127.0	1.5 38.1
25125H	11673 8704	8.0 6.0	190 86	94 4.0	25 635	5.25 133.4	1.25 31.8	5.5 139.7	2.0 50.8
35125H	18539 13824	13.3 9.9	363 165	360 15.2	35 889	6.00 152.4	1.25 31.8	6.0 152.4	2.0 50.8
30175H	21148 15770	11.2 8.4	372 169	272 11.5	30 762	6.00 152.4	1.75 44.5	6.5 165.1	2.5 63.5
40175H	30761 22938	16.7 12.5	651 296	859 36.3	40 1016	7.00 177.8	1.75 44.5	6.5 165.1	2.5 63.5
50175H	40373 30107	22.2 16.6	1012 460	2096 88.5	50 1270	7.50 190.5	1.75 44.5	7.5 190.5	2.5 63.5
35200H	29662 22119	14.3 10.7	600 273	579 24.5	35 889	8.25 209.6	2.00 50.8	8.0 203.2	3.0 76.2
45200H	40648 30311	19.9 14.9	984 447	1578 66.7	45 1143	9.00 228.6	2.00 50.8	9.5 241.3	3.0 76.2
55200H	51634 38504	25.6 19.1	1471 669	3517 148.6	55 1397	10.00 254.0	2.00 50.8	11.0 279.4	3.0 76.2

Notes

- **NOTE:**
  - Disc maximum temperature is 500°F / 260°C above ambient
  - Heat sink capacity is based on one brake application for 60 sec.
  - Continuous heating capacity is based on 100 RPM

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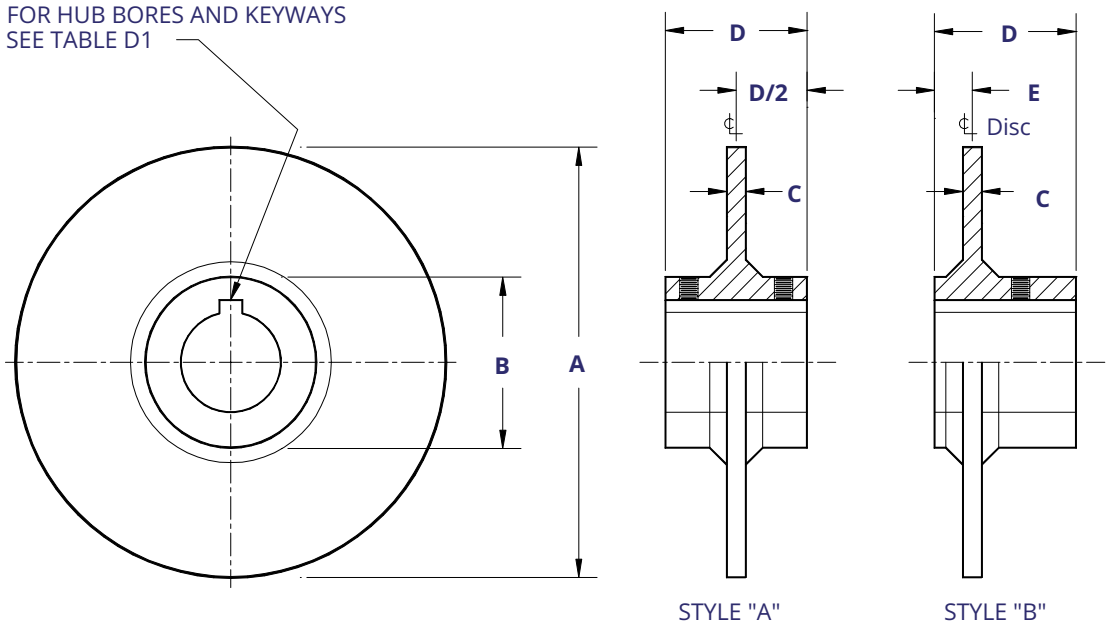
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Hubbed Solid Steel Disc Properties

2800X/3000X/4800/5000/5800/6000 calipers

DRAWING
DMM05-1.0



DISC NO.	ENERGY CAPACITY		WEIGHT	WK²	DIMENSIONS - in./mm				
	HEAT SINK hp-sec. kW-sec.	CONTINUOUS hp kW	lb kg	lb-ft² kg-m²	A	B	C	D	E
30100H	9887 7373	9.4 7.0	240 109	157 6.6	30 762	7 178	1.00 25.4	6.5 165.1	1.5 38.1
35100H	13458 10036	12.3 9.2	327 149	291 12.3	35 889	7.5 191	1.00 25.4	7.5 190.5	1.5 38.1
40100H	17578 13108	15.6 11.6	489 222	504 21.3	40 1016	9.5 241	1.00 25.4	10.5 266.7	1.5 38.1
45100H	20324 15156	18.2 13.6	614 279	803 33.9	45 1143	10.0 254	1.00 25.4	11.5 292.1	2.0 50.8
50100H	23071 17204	20.8 15.5	755 343	1221 51.6	50 1270	10.5 267	1.00 25.4	12.5 317.5	2.0 50.8
55113H	29044 21658	23.6 17.6	990 450	2002 84.6	55 1397	11.0 279	1.13 28.6	13.5 342.9	2.5 63.5
60113H	32134 23962	26.2 19.6	1143 519	2823 119.3	60 1524	11.0 279	1.13 28.6	14.0 355.6	2.5 63.5
65113H	35224 26266	28.9 21.5	1321 600	3882 164.0	65 1651	11.5 292	1.13 28.6	14.0 355.6	2.5 63.5
70113H	38314 28570	31.5 23.5	1537 698	5219 220.5	70 1778	12.0 305	1.13 28.6	15.0 381.0	3.0 76.2
75113H	41403 30875	34.1 25.4	1728 786	6863 290.0	75 1905	12.0 305	1.13 28.6	15.5 393.7	3.0 76.2

Notes

- **NOTE:**
  - Disc maximum temperature is 500°F / 260°C above ambient
  - Heat sink capacity is based on one brake application for 60 sec.
  - Continuous heating capacity is based on 100 RPM

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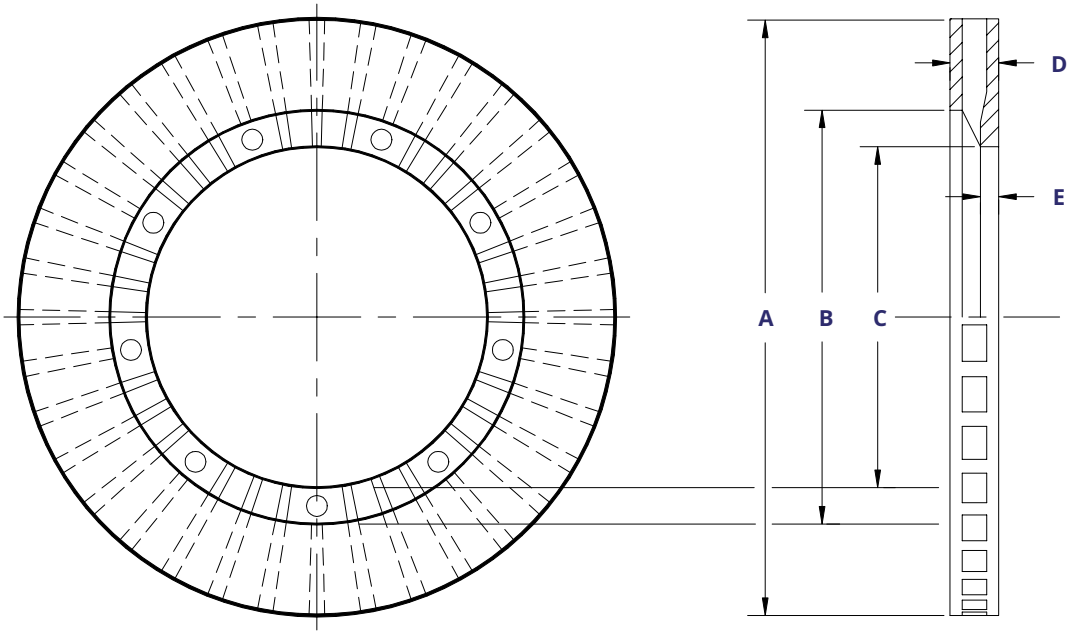
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Ventilated Ductile Iron Disc Properties

800/1000/1800/2000/2800/3000/3800/4000 calipers

DRAWING
DMM06-1.0



DISC NO.	ENERGY CAPACITY		WEIGHT	WK²	DIMENSIONS - in./mm				
	HEAT SINK hp-sec. kW-sec.	CONTINUOUS hp kW	lb kg	lb-ft² kg-m²	A	B	C	D	E
16113V	3046 2271	9.2 6.9	36 16	32 1.4	16 406	7.6 193.6	5.0 127.0	1.13 28.6	0.500 12.7
25125V	5630 4198	13.1 9.8	62 28	56 2.4	25 635	18.0 457.2	16.0 406.4	1.25 31.8	0.625 15.9
30125V	7061 5265	17.7 13.2	85 39	105 4.4	30 762	23.0 584.2	21.0 533.4	1.25 31.8	0.625 15.9
35125V	8538 6367	22.3 16.6	102 46	177 7.5	35 889	28.0 711.2	26.0 660.4	1.25 31.8	0.625 15.9
30175V	12069 9000	24.2 18.0	146 66	185 7.8	30 762	19.0 482.6	16.5 419.1	1.75 44.5	0.750 19.1
40175V	17376 12957	38.5 28.7	209 95	481 20.3	40 1016	29.0 736.6	26.5 673.1	1.75 44.5	0.750 19.1
50175V	22754 16968	55.4 41.3	272 123	1003 42.4	50 1270	39.0 990.6	36.5 927.1	1.75 44.5	0.750 19.1
35200V	20954 15625	36.9 27.5	255 116	389 16.4	35 889	22.0 558.8	20.0 508.0	2.00 50.8	0.875 22.2
45200V	28984 21613	56.2 41.9	351 160	951 40.2	45 1143	32.0 812.8	29.5 749.3	2.00 50.8	0.875 22.2
55200V	37200 27740	78.5 58.5	448 204	1896 80.1	55 1397	42.0 1066.8	39.0 990.6	2.000 50.8	0.875 22.2

Notes

- **NOTE:**
  - Disc maximum temperature is 500°F / 260°C above ambient
  - Heat sink capacity is based on one brake application for 60 sec.
  - Continuous heating capacity is based on 500 RPM

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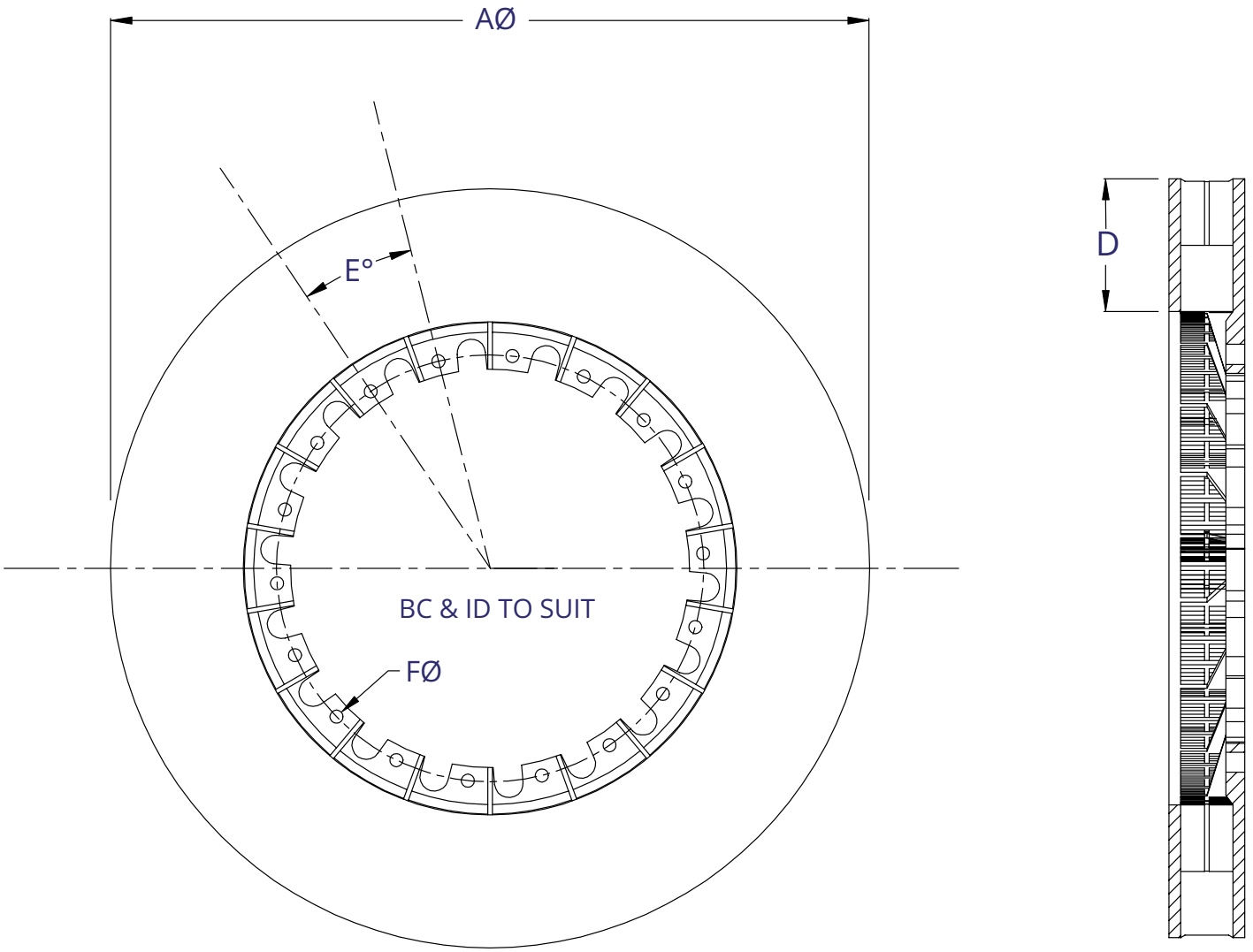
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CVD4 Series Ventilated Brake Discs

4 in [102 mm] Thick

DRAWING
DMM07-1.0



Specifications

Dual imperial / metric (in./mm, lb.ft/Nm)

- High energy ventilated discs, 4 in [102 mm] thick
- Bolt circle and inside diameter to suit
- Max torque quoted at friction coefficient μ = 0.45
- Torque columns are for brake series 3800 and 7800

Model	AØ in/mm	D in/mm	E°	FØ in/mm	Brake series 3800 — max torque lb.ft/Nm	Brake series 7800 — max torque lb.ft/Nm
CVD4400	40.0 / 1016	7.0 / 178	20°	11/16 / 17.5	31680 / 42952	—
CVD4480	48.0 / 1219	7.0 / 178	20°	7/8 / 22.2	39360 / 53364	57600 / 78095
CVD4485	48.5 / 1232	10.5 / 267	30°	11/16 / 17.5	—	41500 / 56200
CVD4545	54.5 / 1384	8.5 / 216	18°	1 1/8 / 28.5	46560 / 63126	66960 / 90785
CVD4630	63.0 / 1600	8.5 / 216	18°	1 1/8 / 28.5	54720 / 74190	79200 / 107380

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Table D1 — Disc Keyway & Hub Torque Capacities

TABLE D1

DISC KEYWAY & HUB TORQUE CAPACITIES

SHAFT DIA., in.		KEYS, in.		TORQUE, ft-lb			HUB DIAMETERS, in.			
							SLIDING FIT		INTERFERENCE FIT	
D_{min}	D_{max}	Width	Height "H"	L = 1 in.	L = 4 × H	L = 16 × H	@ D_{min}	@ D_{max}	@ D_{min}	@ D_{max}
0.75	1.00	0.250	0.250	85	85	339	1.50	1.75	1.50	1.75
1.00	1.25	0.313	0.313	141	176	705	1.70	1.95	1.94	2.19
1.25	1.50	0.375	0.375	212	317	1269	2.09	2.34	2.38	2.63
1.50	1.75	0.438	0.438	296	518	2074	2.48	2.73	2.81	3.06
1.75	2.00	0.500	0.500	395	790	3160	2.88	3.13	3.25	3.50
			0.313	247	309	1234	2.45	2.70	2.69	2.94
2.00	2.50	0.625	0.625	564	1411	5642	3.41	3.91	3.88	4.38
			0.438	395	691	2765	2.98	3.48	3.31	3.81
2.50	3.00	0.750	0.750	846	2539	10156	4.19	4.69	4.75	5.25
			0.500	564	1128	4514	3.63	4.13	4.00	4.50
3.00	3.50	0.875	0.875	1185	4147	16588	4.97	5.47	5.63	6.13
			0.625	846	2116	8463	4.41	4.91	4.88	5.38
3.50	4.00	1.000	1.000	1580	6319	25277	5.75	6.25	6.50	7.00
			0.750	1185	3555	14218	5.19	5.69	5.75	6.25
4.00	5.00	1.250	1.250	2257	11284	45138	6.81	7.81	7.75	8.75
			0.875	1580	5529	22117	5.97	6.97	6.63	7.63
5.00	6.00	1.500	1.500	3385	20312	81248	8.38	9.38	9.50	10.50
			1.000	2257	9028	36110	7.25	8.25	8.00	9.00
6.00	7.00	1.750	1.250	3385	16927	67706	8.81	9.81	9.75	10.75
			1.500	4062	24374	97497	9.38	10.38	10.50	11.50
7.00	8.00	2.000	1.375	4344	23895	95579	10.09	11.09	11.13	12.13
			1.500	4739	28437	113747	10.38	11.38	11.50	12.50
8.00	9.00	2.250	1.500	5417	32499	129996	11.38	12.38	12.50	13.50
			1.625	5868	38141	152565	11.66	12.66	12.88	13.88
9.00	10.00	2.500	1.625	6601	42909	171635	12.66	13.66	13.88	14.88
			1.750	7109	49764	199056	12.94	13.94	14.25	15.25
10.00	11.00	2.750	1.875	8463	63475	253898	14.22	15.22	15.63	16.63
			2.000	9028	72220	288880	14.50	15.50	16.00	17.00
11.00	12.00	3.000	2.000	9930	79442	317768	15.50	16.50	17.00	18.00
			2.125	10551	89683	358730	15.78	16.78	17.38	18.38
12.00	13.00	3.250	2.125	11510	97836	391342	16.78	17.78	18.38	19.38
			2.250	12187	109684	438737	17.06	18.06	18.75	19.75
13.00	14.00	3.500	2.375	13936	132394	529576	18.34	19.34	20.13	21.13
			2.500	14670	146697	586788	18.63	19.63	20.50	21.50
14.00	15.00	3.750	2.500	15798	157981	631925	19.63	20.63	21.50	22.50
			2.625	16588	174174	696697	19.91	20.91	21.88	22.88
15.00	16.00	4.000	2.625	17773	186615	746461	20.91	21.91	22.88	23.88

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Table D1 — Disc Keyway & Hub Torque Capacities

SHAFT DIA., in.		KEYS, in.		TORQUE, ft-lb			HUB DIAMETERS, in.			
							SLIDING FIT		INTERFERENCE FIT	
D	D	Width	Height "H"	L = 1 in.	L = 4 × H	L = 16 × H	@ D_{min}	@ D_{max}	@ D_{min}	@ D_{max}
16.00	17.00	4.250	2.750	18619	204811	819246	21.19	22.19	23.25	24.25
			2.875	20763	238777	955110	22.47	23.47	24.63	25.63
			3.000	21666	259992	1039968	22.75	23.75	25.00	26.00
17.00	18.00	4.500	3.000	23020	276242	1104966	23.75	24.75	26.00	27.00
			3.125	23979	299741	1198965	24.03	25.03	26.38	27.38
18.00	19.00	4.750	3.125	25390	317373	1269492	25.03	26.03	27.38	28.38
			3.250	26405	343271	1373083	25.31	26.31	27.75	28.75
19.00	20.00	5.000	3.375	28944	390750	1562999	26.59	27.59	29.13	30.13
			3.500	30016	420230	1680921	26.88	27.88	29.50	30.50

The above values are based on:

- Key material being C1020 or equivalent @ 65,000 to 70,000 UTS; and an S.F. of 3;
- Hub material being C1030 or equivalent @ 75,000 to 80,000 UTS;
- Torque ratings are based on the Dmin shaft diameter - prorate for other diameters.

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Table D2 — Prime Mover Horsepowers for Marine Propulsion Shaft Brakes

TABLE D2

PRIME MOVER HORSEPOWERS FOR MARINE PROPULSION SHAFT BRAKES

STANDARD CALIPERS	DISC / SHAFT RPM	HP @ DISC DIAMETER, in.				kW @ DISC DIAMETER, mm			
		15	**20**	**25**	**30**	**381**	**508**	**635**	**762**
816 / 1016	100	84	118	152	282	63	88	113	211
	200	169	236	304	565	126	176	227	421
	300	253	354	456	847	188	264	340	632
	400	337	472	608	1061	251	352	453	791
	500	421	591	760	1061	314	440	567	791
		25	**30**	**35**	**45**	**635**	**762**	**889**	**1143**
1836 / 2036	100	330	406	482	634	246	303	359	473
	200	659	811	964	1269	491	605	719	946
	300	989	1217	1146	1903	737	908	1078	1419
	400	1318	1623	1928	2182	983	1210	1437	1627
	500	1648	2029	2182	2182	1229	1513	1627	1627
		30	**35**	**45**	**50**	**762**	**889**	**1143**	**1270**
2836 / 3036	100	381	457	610	686	284	341	455	511
	200	762	914	1219	1371	568	682	909	1023
	300	1143	1371	1829	2057	852	1023	1364	1534
	400	1524	1829	2438	2743	1136	1364	1818	2045
	500	1905	2286	3048	3429	1420	1705	2273	2557
		35	**40**	**45**	**50**	**889**	**1016**	**1143**	**1270**
3836 / 4036	100	884	1036	1189	1341	659	773	886	1000
	200	1768	2072	2377	2682	1318	1545	1773	2000
	300	2651	3109	3566	4023	1977	2318	2659	3000
	400	3535	4145	4754	5364	2636	3091	3545	4000
	500	4419	5181	5943	6424	3295	3863	4431	4790

The above values are based on:

- 100% of shaft prime-mover horsepower/kilowatts;
- Two calipers per disc, coefficient of friction @ 0.5;
- Caliper actuation is 100 psi (689 kPa) or 1000 psi (6890 kPa) hydraulic pressure

*These figures are provided for guidance only and the technical specifics of each application must be evaluated to ensure satisfactory performance

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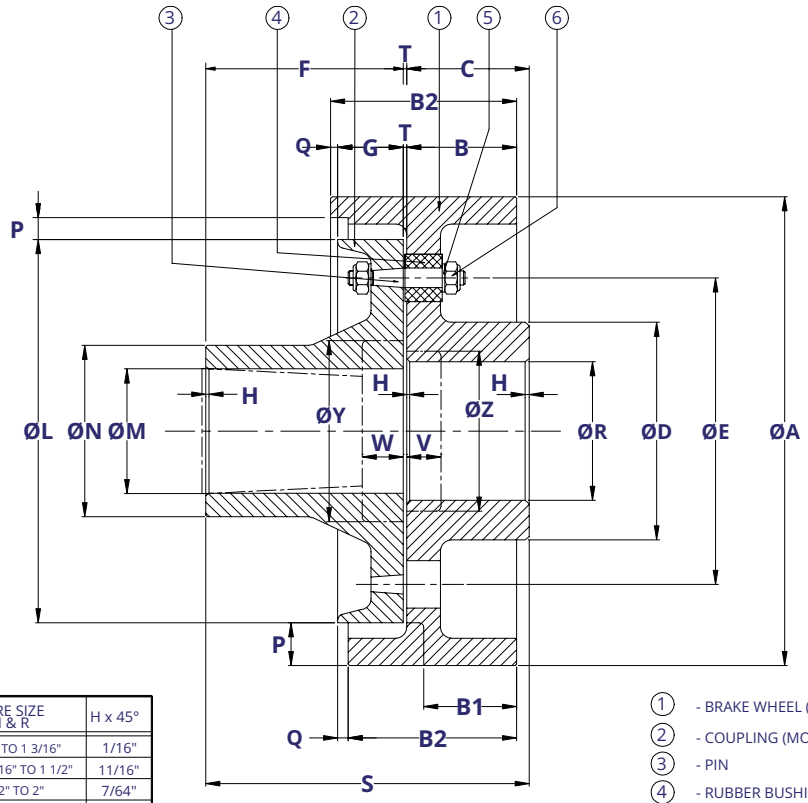
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Brake Wheel c/w Coupling (GA series)

DRAWING
A-BWCLN-1.1



BORE SIZE M & R	H x 45°
UP TO 1 3/16"	1/16"
FROM 1 3/16" TO 1 1/2"	11/16"
FROM 1 1/2" TO 2"	7/64"
FROM 2" TO 2 3/8"	1/8"
FROM 2 3/8" TO 3 1/8"	5/32"
FROM 3 1/8" TO 4"	3/16"
FROM 4" TO 4 3/4"	1/4"

1. - BRAKE WHEEL (REDUCER SIDE)
2. - COUPLING (MOTOR SIDE)
3. - PIN
4. - RUBBER BUSHING
5. - STEEL FLAT WASHER
6. - LOCK NUT

Specifications

Imperial (inches, AISE)

- Assembly: 1 brake wheel (reducer side), 2 coupling (motor side), 3 pin, 4 rubber bushing, 5 steel flat washer, 6 lock nut
- Materials: close grained cast iron standard; ductile iron and steel are optional
- Balancing: max RPM is based on 6000 rpm peripheral speed; balancing required over 4000 RPM
- Protection: special coatings and platings available for corrosive environments
- Order: customer must specify bore, keyway and tolerance information (DIN sizes also available)
- Bore size chamfer H × 45°: up to 1-3/16 in = 1/16; 1-3/16 to 1-1/2 = 11/16; 1-1/2 to 2 = 7/64; 2 to 2-3/8 = 1/8; 2-3/8 to 3-1/8 = 5/32; 3-1/8 to 4 = 3/16; 4 to 4-3/4 = 1/4

Model number	Max torque (ft-lb)	A	B	B1	B2	C	D	E	F	G	L h9	M max H7	N	P	Q	R max H7	S	T	V	W	Y	Z	n	WK² (lb-ft²)
GA.08	184.4	8	3.375	3.25	—	4.00	3.125	5.00	4.25	2.00	7.00	—	1.625	3.125	0.45	—	2.00	8.375	0.125	0.75	—	—	2.375	4
GA.10	405.6	10	4.125	3.75	—	5.00	4.00	6.25	5.625	2.00	8.625	—	2.375	4.00	0.67	—	2.375	10.75	0.125	0.875	1.50	3.00	2.75	6
GA.13	921.8	13	5.25	—	5.75	6.00	5.125	7.875	5.625	2.375	10.625	1.25	2.75	5.125	1.18	2.00	1.25	3.125	11.825	0.20	1.00	1.50	3.50	3.50
GA.16	2065.0	16	6.00	—	6.75	6.70	6.00	10.00	6.875	2.75	13.188	1.625	3.125	5.125	1.40	2.063	1.625	3.50	13.775	0.20	1.063	2.00	4.125	4.00
GA.19	4646.0	19	5.125	—	8.75	7.50	6.30	12.50	7.00	3.125	16.750	2.188	3.50	6.30	0.43	0.25	2.20	4.00	14.75	0.25	1.188	2.375	4.75	4.375

Model number	Weight (lbs)		
GA.08	1.875	42.25	
GA.10	4.75	75.0	
GA.13	6	17.16	144.0
GA.16	6	44.38	233.2
GA.19	6	116.0	387.2

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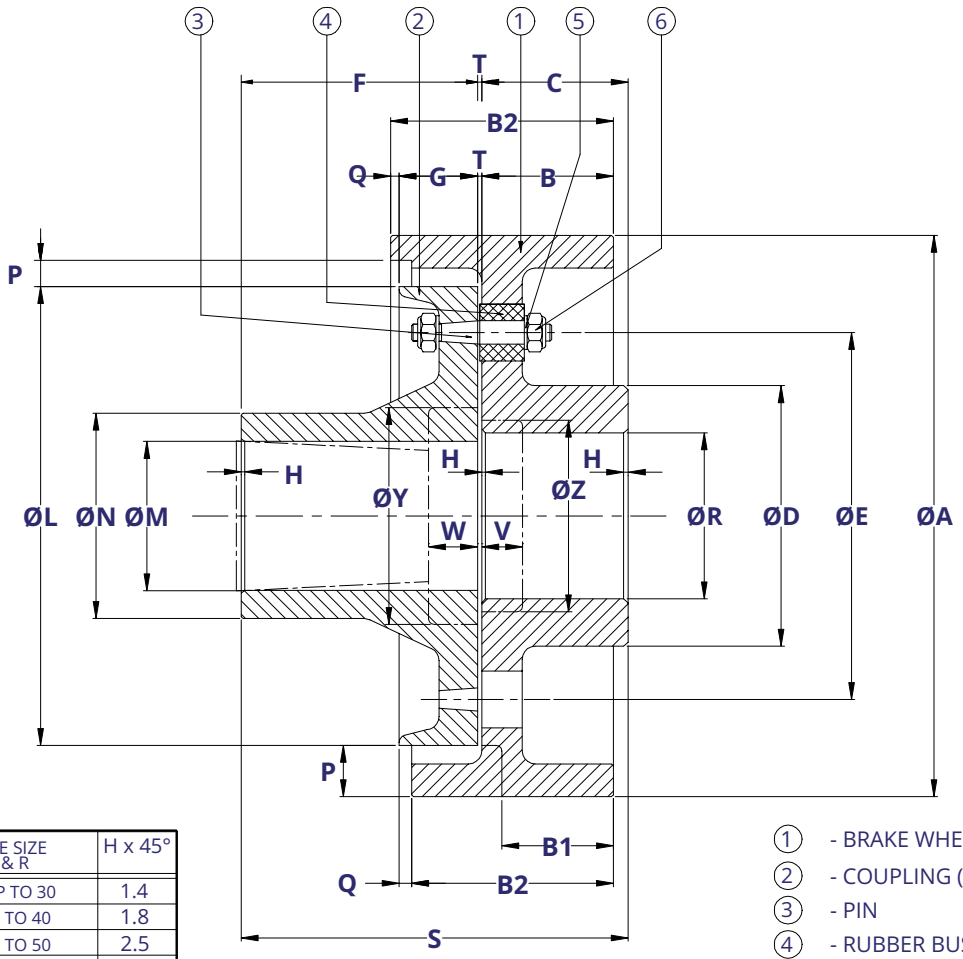
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Brake Wheel c/w Coupling (GA metric series)

DRAWING
A-BWCM-1.1



BORE SIZE M & R	H x 45°
UP TO 30	1.4
FROM 30 TO 40	1.8
FROM 40 TO 50	2.5
FROM 50 TO 60	3
FROM 60 TO 80	4
FROM 80 TO 100	5
FROM 100 TO 120	6

1 - BRAKE WHEEL (REDUCER SIDE)
2 - COUPLING (MOTOR SIDE)
3 - PIN
4 - RUBBER BUSHING
5 - STEEL FLAT WASHER
6 - LOCK NUT

Specifications

Metric (millimeters, DIN); torque in daN-m

- Assembly: 1 brake wheel (reducer side), 2 coupling (motor side), 3 pin, 4 rubber bushing, 5 steel flat washer, 6 lock nut
- Materials: close grained cast iron standard; ductile iron and steel are optional
- Balancing: max RPM is based on 6000 rpm peripheral speed; balancing required over 4000 RPM
- Protection: special coatings and platings available for corrosive environments
- Order: customer must specify bore, keyway and tolerance information (AISE sizes also available)
- Bore size chamfer H × 45°: up to 30 = 1.4; 30–40 = 1.8; 40–50 = 2.5; 50–60 = 3; 60–80 = 4; 80–100 = 5; 100–120 = 6

Model number	Max torque (daN-m)	A	B	B1	B2	C	D	E	F	G	L h9	M max H7	N	P	Q	R max H7	S	T	V	W	Y	Z	n	WK² (kg-m²)	Weight (kg)		
GA.203.2	25	203	85	83	—	100	80	125	110	50	180	—	42	80	11.5	—	50	214	4	20	—	—	60	4	0.079	19.2	
GA.254.2	55	254	105	95	—	125	100	160	145	50	220	—	60	100	17	—	60	274	4	22	40	75	70	6	0.200	33.9	
GA.330.2	125	330	133	—	146	153	130	200	145	60	270	32	70	130	30	52	32	80	303	5	24	40	90	90	6	0.723	65.4
GA.406.2	280	406	150	—	172	170	150	250	175	70	335	42	80	130	35.5	53	42	90	350	5	27	50	105	100	6	1.87	106
GA.482.1	630	482	130	—	222	190	160	315	180	80	425	56	90	160	11	6	56	100	376	6	30	60	120	110	6	4.89	176

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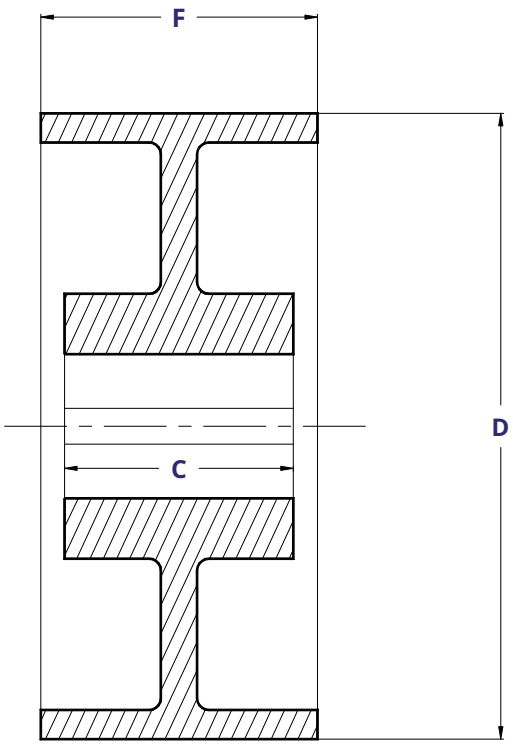
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Shoe Brake Wheels

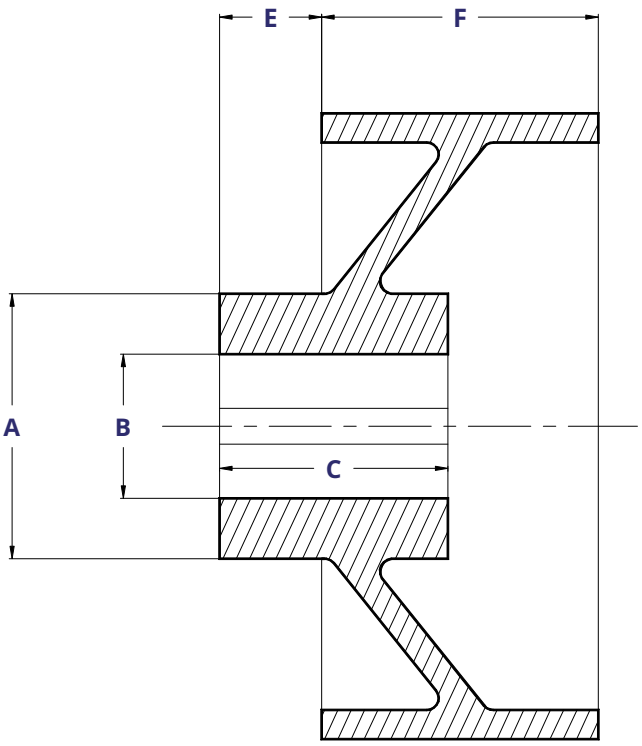
SH (symmetrical hub) & XH (offset hub)

DRAWING
BWA-01.0

SH



XH



Specifications

Imperial (inches, lb-ft², lb)

- **NOTE:**
  - Brake wheels are available in rough stock bore of A/3 inches.
  - For straight bore, specify size and tolerancing.
  - For tapered bore, specify dimensions or AISE motor frame size.
  - Specify keyway size and fixings as required.
- Materials: close grained cast iron standard; ductile iron and steel are optional
- Balancing: max RPM is based on 6000 fpm peripheral speed; balancing required over 4700 RPM
- Protection: special coatings and platings available for corrosive environments

Model — symm. hub	Model — offset hub	Brake wheel dia. D	Face F	Hub C max	Hub E max	Hub A max	Hub B max	Max RPM	WK² (lb-ft²)	Net weight (lb)
4SH	4XH	4	2.25	2.00	0.75	2.00	1.00	5730	0.1	7
6SH	6XH	6	3.25	2.00	1.75	3.00	1.75	3820	0.3	15
8SH	8XH	8	4.25	4.00	2.38	4.25	2.75	2860	1.3	27
10SH	10XH	10	4.25	4.00	2.38	4.25	2.75	2290	3.0	35
12SH	12XH	12	5.25	5.00	2.50	5.25	3.25	1910	8.2	71
13SH	13XH	13	5.75	5.00	2.50	5.75	4.25	1760	13.5	88
15SH	15XH	14	6.25	6.00	3.13	8.00	5.50	1525	24.0	112
16SH	16XH	16	6.75	6.00	3.13	7.00	4.25	1430	33.5	182
19SH	19XH	19	8.75	8.00	3.13	7.00	5.00	1200	81.0	230
23SH	23XH	23	11.25	10.50	4.13	10.00	7.00	995	212.0	390
30SH	30XH	30	14.25	13.50	4.75	13.25	8.00	765	630.0	610

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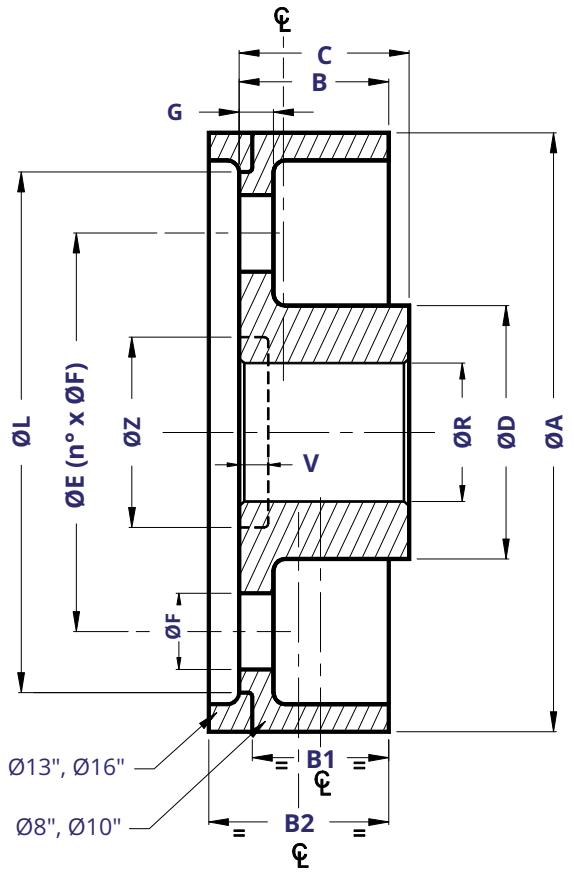
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Shoe Brake Wheels

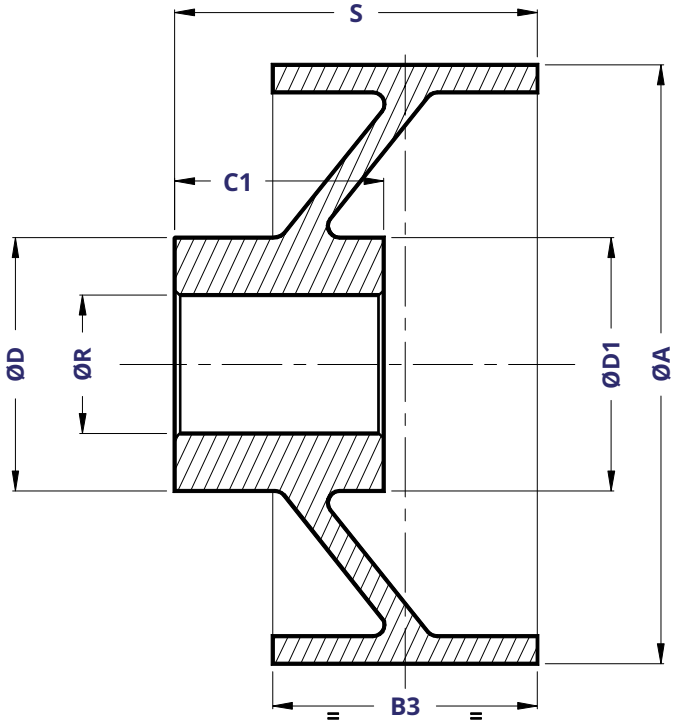
"PAG" & "PA"

DRAWING
BGWA-01.0

"PAG"



"PA"



Specifications

Imperial (inches); torque in N m; weight in kg

- Materials: ductile cast iron
- Balancing: max RPM is based on 6000 fpm peripheral speed; balancing required over 700 RPM
- Protection: special coatings and platings available for corrosive environments
- Brake wheel available in rough stock bore

Drum type	Max torque [N m]	Max RPM	ØA	B	B1	B2	B3	C	C1	ØD	ØE	ØF not machined	ØF machined	G	ØL h9	ØR max H7	S	V max	X	ØZ max	n°	Weight [kg]
PA 6	270	5020	6	-	-	-	2.36	-	3.5	2.76	-	-	-	-	-	1.77	4.72	-	-	-	-	4.9
PA 8	580	3760	8	-	-	-	3.27	-	4	3.94	-	-	-	-	-	2.56	5.63	-	-	-	-	10.9
PAG 8	580	3760	8	3.35	3.28	-	-	3.94	-	3.15	4.92	1.38	1.57	0.98	7.09	1.97	-	0.79	-	2.36	6	10.1
PA 10	1210	3000	10	-	-	-	3.74	-	4.5	4.72	-	-	-	-	-	3.15	6.14	-	-	-	-	18.7
PAG 10	1210	3000	10	4.13	3.74	-	-	4.92	-	3.94	6.3	1.38	1.57	0.98	8.66	2.36	-	0.87	-	2.76	6	17.7
PA 13	2560	2310	13	-	-	-	5.75	-	5	6.5	-	-	-	-	-	4.33	8.25	-	-	-	-	40.6
PAG 13	2560	2310	13	5.24	-	5.75	-	6.02	-	5.12	7.87	1.77	1.97	1.18	-	3.15	-	0.94	-	3.54	6	38.6
PA 16	5320	1880	16	-	-	-	6.77	-	5.5	7.09	-	-	-	-	-	4.72	9.88	-	-	-	-	63.5
PAG 16	5320	1880	16	5.91	-	6.77	-	6.69	-	5.91	9.84	2.13	2.36	1.38	-	3.54	-	1.06	-	3.94	6	64.2
PA 19	11020	1580	19	-	-	-	8.74	-	6.75	9.45	-	-	-	-	-	5.91	11.89	-	-	-	-	120

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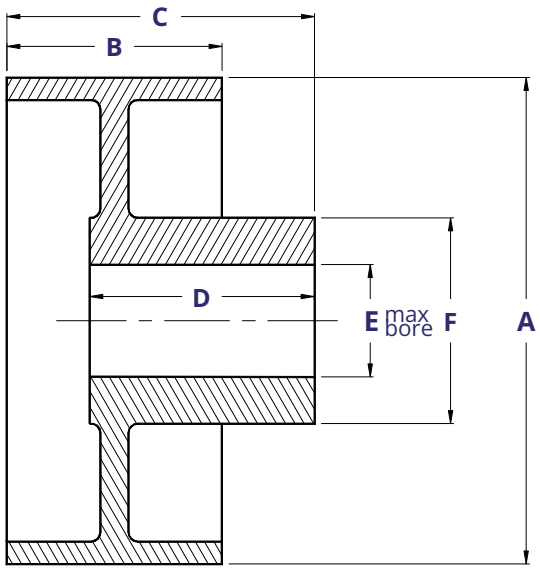
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Sella Standard Brake Drums

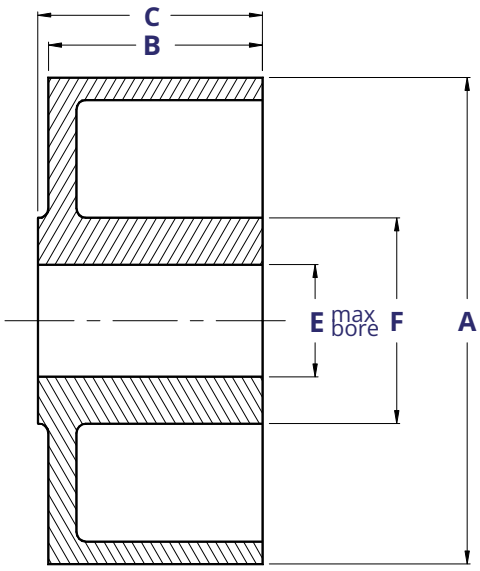
Type A & B

DRAWING
SBB-01.0

TYPE A



TYPE B



Specifications

Dual inches / millimeters

- **NOTE:**
  - Brake drums are available on short deliveries in:
  - Metric dimensions to DIN 15431
  - Imperial dimensions.
  - Customers must specify bore and keyway dimensions and tolerances with order.
- Material: close grained cast iron or S.N.G. iron
- Balancing: all drums required for applications with a peripheral speed in excess of 24 m/sec (82 ft/sec) should be balanced
- The drawing also carries a blank order form for shaft dia., bore dia., keyway (parallel or B.S. taper) width and depth, and pilot bore dia.

Model — Type A hub	Model — Type B hub	Brake wheel dia. A	Face B	C max Type A	C max Type B	D max	E max	F max Type A	F max Type B
4A / 100A	4B / 100B	4 / 100	2 1/8 / 54	2 9/16 / 65	2 1/8 / 54	1 9/16 / 40	1 3/8 / 35	2 3/16 / 55	2 3/16 / 55
6A / 160A	6A / 160B	6 / 160	3 1/4 / 60	3 13/16 / 85	3 21/64 / 62	2 7/16 / 62	1 3/4 / 45	2 13/16 / 72	2 13/16 / 72
8A / 200A	8B / 200B	8 / 200	4 1/4 / 75	4 7/8 / 106.5	4 21/64 / 77	3 1/16 / 77	2 / 50	3 1/8 / 80	3 1/8 / 80
10A / 250A	10B / 250B	10 / 250	4 1/4 / 95	5 5/8 / 135.5	4 21/64 / 97	3 13/16 / 97	2 3/8 / 60	3 3/4 / 95	3 3/4 / 95
12A / 315A	12B / 315B	12 / 315	5 1/4 / 118	7 / 169	5 21/64 / 120	4 3/4 / 120	2 3/4 / 70	4 3/16 / 110	4 5/16 / 110
16A / 400A	16B / 400B	16 / 400	6 1/4 / 150	8 11/16 / 216	6 3/8 / 153	6 / 153	3 9/16 / 90	5 7/8 / 150	5 7/8 / 150
20A / 500A	20B / 500B	20 / 500	9 1/4 / 190	11 11/16 / 274	9 3/8 / 193	7 5/8 / 193	3 15/16 / 100	7 1/16 / 180	7 5/16 / 180
24A / 630A	24B / 630B	24 / 630	10 1/4 / 236	13 13/16 / 339	10 13/32 / 240	9 7/16 / 240	4 3/4 / 120	7 1/2 / 190	7 1/2 / 190

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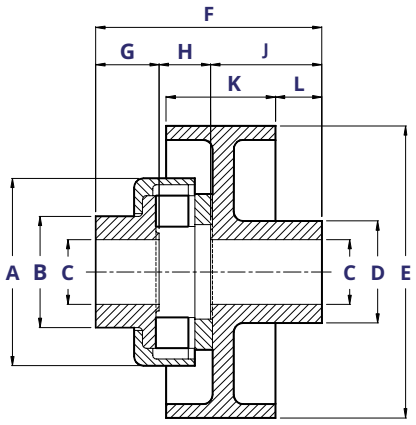
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Sella Flexible Brake Drum Couplings

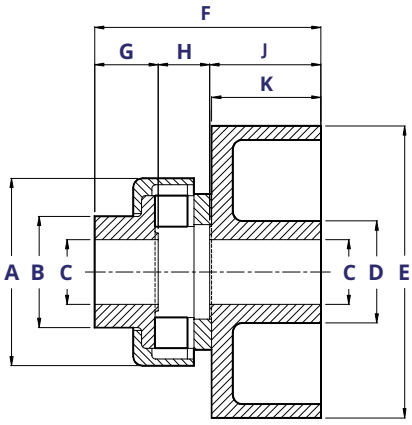
Over Centre (SFB) & Offset (OSB)

DRAWING
SCB-01.0

OVER CENTRE TYPE



OFFSET TYPE



Typical Ordering Code: Coupling size 40SF2/B250
B=Brake Drum (as DIN 15430)
250= DIA, mm

OVER CENTRE TYPE - SFB

Specifications

Metric (millimeters, Nm, Kg, Kgm²)

- Customer must specify bore, keyway & tolerance information when ordering.
- Imperial Drum Sizes also Available.
- Typical ordering code: coupling size 40SF2/B250 — B = brake drum (as DIN 15430), 250 = dia. in mm
- Offset type — other sizes up to 400 dia. available upon request

Type	Brake drum dia. E	Brake drum width K	Coupling size	Rated torque Nm	Max RPM for GD11C.I.	A	B	Max bore C	D	F	G	H	J	L	Weight Kg	J (WR²) Kgm²
Over centre SFB	100	54	6.3SF	63	3500	90	65	35	55	98	38	20	40	22	1.77	0.003
Over centre SFB	160	60	16SF1	160	3000	127	78	45	72	144	54	28	62	25	7.8	0.013
Over centre SFB	200	75	40SF1	400	2400	158	96	50	80	177	63	37	77	32	14.2	0.062
Over centre SFB	250	95	40SF2	400	1900	158	96	60	95	196	63	36	97	41	21.1	0.14
Over centre SFB	250	95	63SF1	630	1900	181	110	60	95	210	69	44	97	41	22.9	0.15
Over centre SFB	250	95	100SF1	1000	1900	202	120	60	95	226	77	52	97	41	25.5	0.17
Over centre SFB	315	118	63SF2	630	1500	181	110	70	110	230	69	41	120	51	37.2	0.43
Over centre SFB	315	118	100SF2	1000	1500	202	120	70	110	244	77	47	120	51	39.8	0.46
Over centre SFB	315	118	160SF1	1600	1500	230	130	70	110	265	84	61	120	51	42.5	0.48
Over centre SFB	315	118	250SF1	2500	1500	257	145	70	110	281	91	70	120	51	47	0.54
Over centre SFB	400	150	250SF2	2500	1200	257	145	90	150	304	91	60	153	66	75	1.83
Over centre SFB	400	150	400SF1	4000	1200	290	160	90	150	333	99	81	153	66	78	1.41
Over centre SFB	400	150	630SF1	6300	1200	332	192	90	150	360	119	88	153	66	113	1.83
Over centre SFB	500	190	250SF2	2500	960	257	145	90	180	344	91	60	193	84	106	3.91
Over centre SFB	500	190	400SF2	4000	960	290	160	100	180	362	99	70	193	84	115	4.19
Over centre SFB	500	190	630SF2	6300	960	332	192	100	180	389	119	77	193	84	138	5.29
Over centre SFB	630	236	400SF2	4000	770	290	160	100	190	408	99	69	240	103	181	10.10
Over centre SFB	630	236	630SF2	6300	770	332	192	120	190	435	119	76	240	103	204	11.12
Offset OSB	200	75	63SF1	630	2400	181	110	50	80	190	69	44	77	—	16	0.072
Offset OSB	250	95	160SF1	1600	1900	230	130	60	95	242	84	61	97	—	28.2	0.207

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Elevanja Discs and Flexible Couplings

Output and dimensions

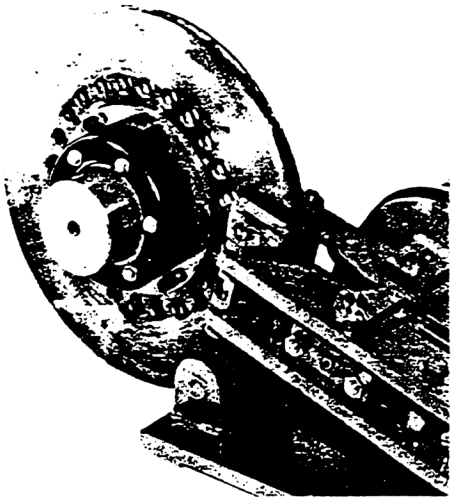
'ELEVANJA' DISCS AND FLEXIBLE COUPLINGS

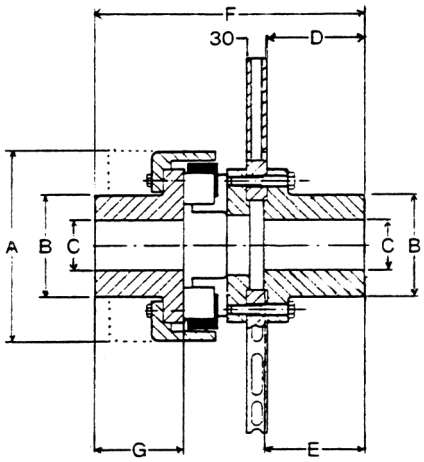
are designed to work in conjunction with series CU Caliper Brakes.

The Discs are available as Solid or Ventilated, when ordering a Ventilated Disc, please add the suffix 'V' to the ordering code.

Material: The Discs and Couplings are supplied in SG Iron (Solid Discs can be supplied in Forged Steel) with a Brinell of 200 or over for the brake path.

Selection: The selection of the Coupling is based on the standard SELLA series. Please refer to list C100S





Disc with Coupling — Typical Ordering Code: 400 SFI/D500v

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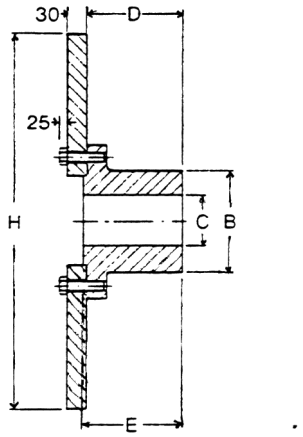
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Elevanja Discs and Flexible Couplings

Output and dimensions



Disc with Hub — Typical Ordering Code: D630b

Output and Dimensions

COUPLING-DISC	RATED TORQUE NM	DISC WITH COUPLING		PLAIN DISC		A	B	C MAX	D MAX	E	F	G	H
		Wt Kg	WR2 KGM2	Wt Kg	WR2 KGM2								
100SFI-D315	1000	34	0.25	23	0.21	173	120	75	120	123	278	77	315
160SFI-D400	1600	53	0.6	37	0.5	198	130	80	140	143	314	84	400
250SFI-D500A	2500	82	1.5	60	1.3	257	145	90	160	164	349	91	500
400SFI-D500B	4000	99	1.6	66	1.4	290	160	100	180	184	389	99	500
400SFI-D630A	4000	122	3.5	90	3.3	290	160	100	180	184	389	99	630
630SFI-D630LB	630	160	4.0	130	3.3	332	192	120	210	214	450	119	630
400SFI-D710A	4000	136	5.5	103	5.2	290	160	100	180	184	389	99	710
630SFI-D710B	6300	177	6.0	120	5.3	332	192	120	210	214	450	119	710
630SFI-D800A	6300	200	9.2	143	8.5	332	192	120	210	214	450	119	800
1000SFI-D800B	10000	252	10	167	8.8	382	225	140	240	244	506	140	800

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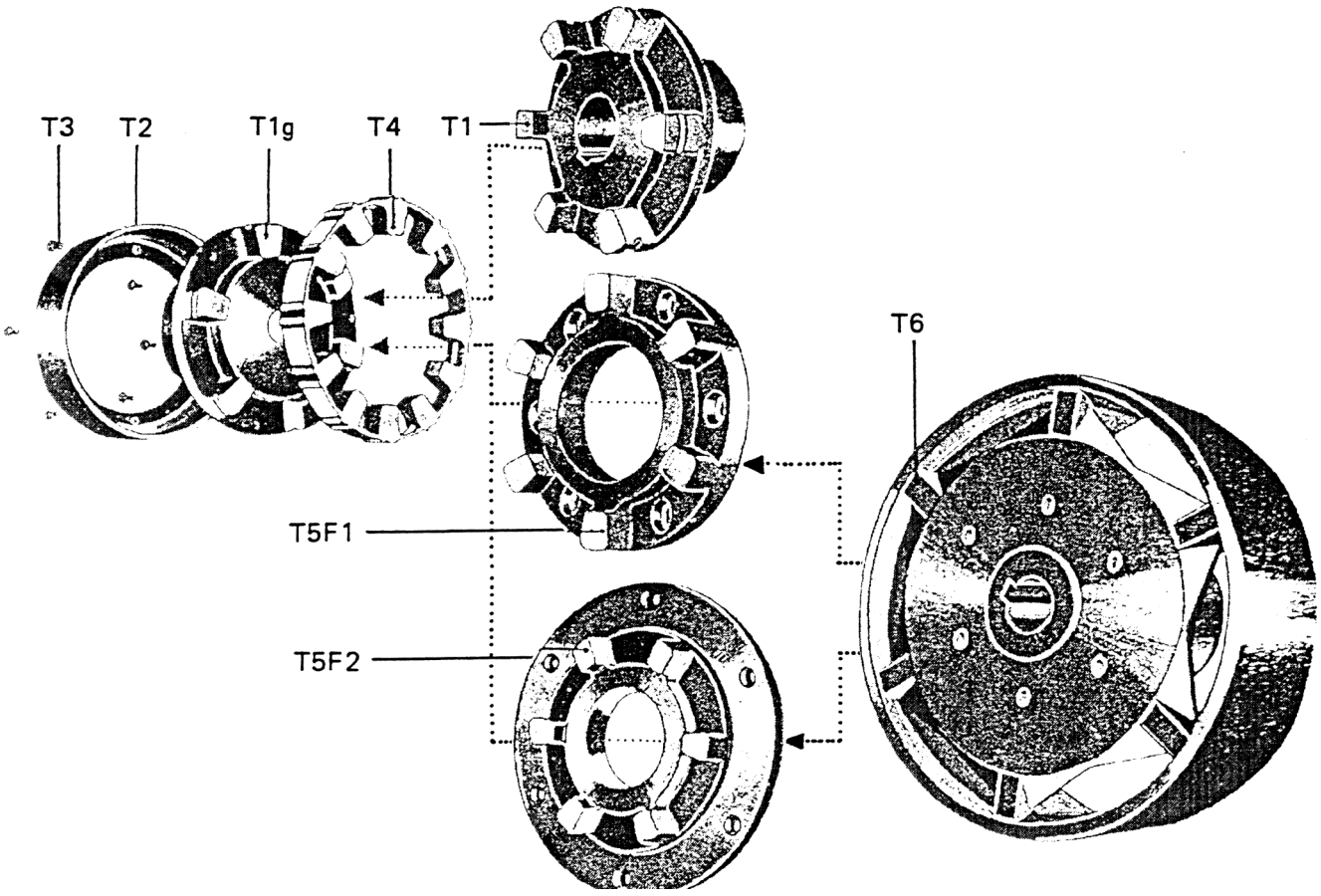
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Sella Transmission Couplings

Parts and components references

'SELLA' Range of Transmission Couplings

Parts and Components References



Part Number	Description	
T1	Half hub with Standard Pilot Bore	
T1g	Half hub with Standard Pilot Bore (drilled for item T2)	
T2	Retaining Cap	
T3	Screws for Retaining Cap. Plus thick washers.	
T4S	Toothed ring up to and including size 63	Elastic Element
T4SA	Rubber Buffers for sizes 100 upwards	
T5F1 or F2	Flange Star	
T6	Brake Drum. Please indicate size and grade of material.	

COUPLING BUILD-UP

Standard Shaft Coupling 'Sella' SW types	T1–T1g–T2–T3–T4
Brake Drum Coupling 'Sella' SFB types	–T1g–T2–T3–T4–T5–T6

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Sella Transmission Couplings

Parts and components references

ORDERING CODE FOR SPARES

Item require (T2) for 63 SF2/B315

i.e. retaining cap for 315mm dia. drum with 63 size coupling

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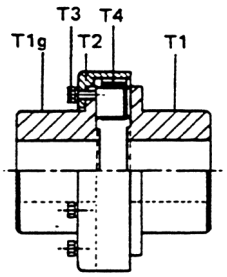
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Sella Transmission Couplings

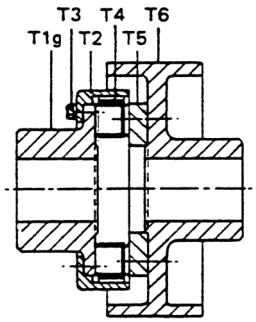
Assembly and maintenance instructions

'SELLA' Range of Transmission Couplings

Assembly and Maintenance Instructions



Shaft Coupling Type SW



Brake Drum Coupling Type SFB

Component Reference

T1	Hub
T1g	Hub fitted with Retaining Cap
T2	Retaining Cap
T3	Securing Screw
T4	Elastic Element
T5	Flange Star
T6	Brake Drum

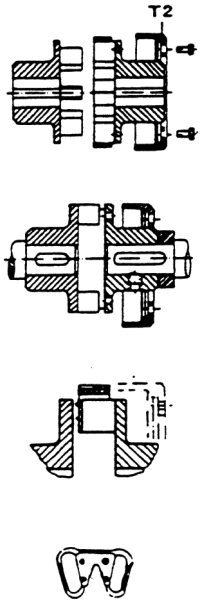
ASSEMBLY PROCEDURE

03

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Sella Transmission Couplings

Assembly and maintenance instructions



1. Push unscrewed retaining cap T2 to one side.
2. Remove the Elastic Element T4
3. Key the half hubs axially positioned firmly against shaft shoulder or distance collar, if parallel key is used locate by socket screw, alternatively by shaft circlip. Ensure retaining cap T2 is passed over the shaft prior to fitting hub.
4. Set the drives so that the two half couplings are distance S, S1 or S2 apart and align radially and angularly. N.B. It may not be possible to use the S1 or S2 dimensions for setting some sizes of SFB brake drum couplings of the over centre types. If not use dimension over shaft bosses — dimension 'F' overleaf.
5. The shafts to be coupled **MUST** be positioned with great accuracy relative to each other, and the relative driving and driven machines dowelled into their correct positions. There should be **NO** angular or parallel misalignment of shafts at installation.
6. Dry the elastic element and re-assemble using talcum powder or soft soap.
7. Re-assemble the retaining cap using THICK Washers and secure well, check screws after test run.

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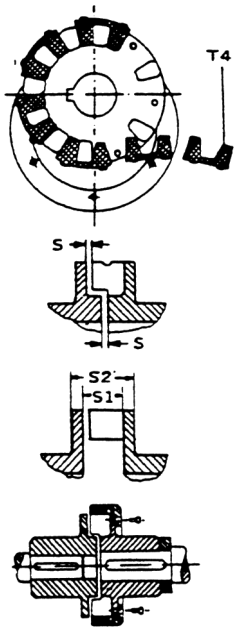
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Sella Transmission Couplings

Assembly and maintenance instructions



Setting Torque for High Tensile Setscrew Grade 8.8 Thread 8g

Metric Thread Size	M6	M8	M10	M12	M14	M16	M20
INITIAL Torque Kgfm	1.0	2.5	4.7	7.8	12.0	18.0	33.0
INITIAL Torque lb. ft.	7.23	18	34	56.4	86.8	130.1	238.7

When securing the Flange in the case of brake couplings, care must be given to bolting on the flange. The

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Sella Couplings

Characteristic values · shaft displacement

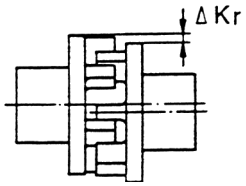
Characteristic values of the couplings

The following torques for T_{KN} and T_{Kmax} correspond to "flexible shaft couplings DIN 740 part 2" and apply for the standard versions with flexible elements with hardness of 75 – 80° Shore A. Characteristics of other qualities of flexible elements are also available.

coupling size		nominal torque T_{KN}	maximum torque T_{Kmax}	torsional angle at		max. shaft displacement			maximum speed
				T_{KN}	T_{Kmax}	ΔK_r	ΔK_A	ΔK_u	
		(Nm)	(Nm)	(grade)	(grade)	(mm)	(mm)	(mm)	(rpm)
MMS/MMS-A	4	40	120	6	12	0.5	1.0	1.0	9800
MMS/MMS-A	6,3	63	189	6	12	0.5	1.0	1.0	8300
MMS/MMS-A	10	100	300	4	9	0.6	1.0	1.2	7100
MMS/MMS-A	16	160	480	4	9	0.6	1.0	1.3	6300
MMS/MMS-A	25	250	750	4	9	0.7	1.0	1.4	5700
MMS/MMS-A	40	400	1 200	4	9	0.7	1.2	1.5	5100
MMS/MMS-A	63	630	1 890	4	9	0.8	1.2	1.6	4500
MMS/MMS-A	100	1 000	3 000	4	9	0.9	1.2	1.7	3900
MMS/MMS-A	160	1 600	4 800	4	9	1.0	1.5	1.8	3400
MMS/MMS-A	250	2 500	7 500	4	9	1.2	1.5	2.0	3000
MMS/MMS-A	400	4 000	12 000	4	9	1.4	1.5	2.2	2700
MMS/MMS-A	630	6 300	18 900	4	9	1.6	1.5	2.4	2300
MMS/MMS-A	1000	10 000	30 000	4	9	1.8	2.0	2.6	2000
MMS/MMS-A	1600	16 000	48 000	4	9	2.0	2.0	2.8	1760
MMG	2500	16 000	75 000	4	7	2.0	2.5	2.5	1560
MMG	4000	25 000	120 000	4	7	2.2	2.5	2.5	1370
MMG	6300	40 000	189 000	4	7	2.5	3.0	3.0	1200
MMG	10 000	63 000	300 000	4	7	2.8	3.5	3.5	1050
MMG	16 000	100 000	480 000	5	8	3.0	4.0	4.0	910
MMG	25 000	160 000	750 000	5	8	3.5	5.0	4.5	806
MMG	40 000	250 000	1 200 000	5	8	4.0	6.0	5.0	650
MMG	63 000	400 000	1 890 000	4	7	4.0	7.0	5.0	580
MMG	100 000	630 000	3 000 000	3	5	4.0	8.0	5.0	520
MMG	160 000	1 000 000	4 800 000	3	5	4.0	10.0	6.0	available on request
MMG	250 000	1 600 000	7 500 000	3	5	4.0	10.0	6.0	

The maximum speeds are applicable for standard couplings type MMS and MMG with grey cast iron (GG 25). Maximum speeds of type MMS-A and materials of higher strength are also available.

Shaft displacement



Radial displacement

03

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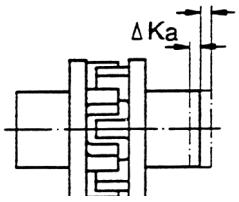
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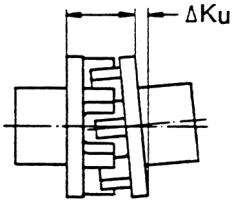
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Sella Couplings

Characteristic values · shaft displacement



Axial displacement



Angular displacement

The values of shaft displacement are approximate. They are dependent on speed and load of the coupling.

An exact alignment of the coupling increases the working life of the flexible elements.

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Sella Couplings

Selection of coupling size · service factors

Selection of coupling size

The selection of the coupling size should be made in such a way that the permissible coupling load is not exceeded in any possible operating condition. The rated torque of the coupling T_{KN} must be at least as large as the rated torque of the load side T_{LN} in the total speed range.

$$T_{KN} \geq T_{LN}$$

The torque of the drive or load side is calculated as follows:

$$T_{AN}/LN\ (Nm) = 9550 \times P\ (kW) \div n\ (min^{-1})$$

Apart from the load of the coupling due to the drive torque T_{AN} and the mode of operation of the drive machine, additional loads can be applied to the coupling from the load side, dependent on the type of drive machine.

The changes in the coupling load from the drive and load side, and changes in the coupling properties due to high ambient temperatures should be taken into consideration by means of the following factors.

Service factors

Drive factor S_a

Considers the mode of operation and the behaviour of the driving machine

Working machine	Electro-motor steam and gas turbine	Water turbine	Internal combustion engine			
			≥ 4-cyl.	3-cyl.	2-cyl.	1-cyl.
Working factor S_a	1.0	1.2	1.2	1.5	2.5	3.0

Start factor S_z

Considers the additional loads due to starting frequency, braking and changes in direction of rotation.

Starting frequency Z per hour	30	60	120	240	>
Start factor S_z	1.0	1.1	1.2	1.3	available on request

Temperature factor S_t

Considers the reduction of the coupling's capacity for load resulting from high ambient temperatures in the direct near of the coupling.

Ambient temperature t in °C		30°	40°	50°	60°	70°	80°	90°	100°	>100°
Standard element NR-SBR	S_t	1.0	1.1	1.2	1.3	1.5	1.6	–	–	–
NBR	S_t	1.0	1.0	1.0	1.0	1.1	1.2	1.4	1.6	available on request

Mass factor S_m

Considers the mass distribution of the drive and load side and the mode of the operation of the driven machine.

Working machines...	S_m
with uniform load and low masses to be accelerated	1.25
Centrifugal pumps for liquid materials, small ventilators, small conveying devices, flywheel transmission.	
with uniform load and medium masses to be accelerated	1.4

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Sella Couplings

Mass factor · torque shock loads

Working machines...	
Conveyor drives with bulk materials, agitating machines for liquid materials, exhausters, medium ventilators, small wood preparation and textile machines, tool machines with rotary movements, hydraulic pumps, heavy centrifugal pumps.	
with unequal load and medium masses to be accelerated	
Hoisting gear, crane traveling gear, revolving furnaces, agitating machines (semi-liquid material), rotary piston blowers, wood processing machines, load winding gear, grinding machines, washing machines, mixers, opening machines, ring spinning frames, vibration screens, conveyor and cooling drums, printing machines, winches, screwtype compressors, rotation compressors, piston pumps.	1.6
with unequal load and medium masses to be accelerated and shocks	
Piston pumps, pendulum and ball mills, mining fans, presses lifts, hoisting devices, draw benches, concrete mixers, drop hammers, small roller tables, crushing mills, small ship drives, weaving looms, plate conveyors, turbo compressors, carding machines, take-up stance, compressor from 8 cylinders onwards, extruders, generators.	1.8
with unequal load drive and large masses to be accelerated and heavy shocks	
Welding generators, paper calenders, hammer drives, chaser mills, sifting machines, tumbling barrels, sand pumps, shears, forge presses, punches, piston compressors 4–6 cylinders, large mining ventilators, paper machines, sheet metal rolling units, ball mills.	2.1
with unequal load and extremely large masses to be accelerated and heavy shocks	
Metal rolling units, rubber rolling units, heavy calenders, large ship propellers, hammer mills, piston compressors 1–3 cylinders, multi stage compressors, ore and rock breakers, heavy rolling mills, piston compressors 1–2 cylinders, cutter head drives, plunger pumps.	2.8

Torque shock loads

The permissible maximum torque of the coupling T_{Kmax} must be greater than or equal to the torque shock forces which occur during operation also taking the temperature and start frequency into consideration.

$$T_{Kmax} \geq T_{Shock} \times S_z \times S_t$$

Loads due to intermittent alternating torque

A torsion oscillation calculation should always be made for drives with internal combustion engines or working machines with intermittent alternating torque loads.

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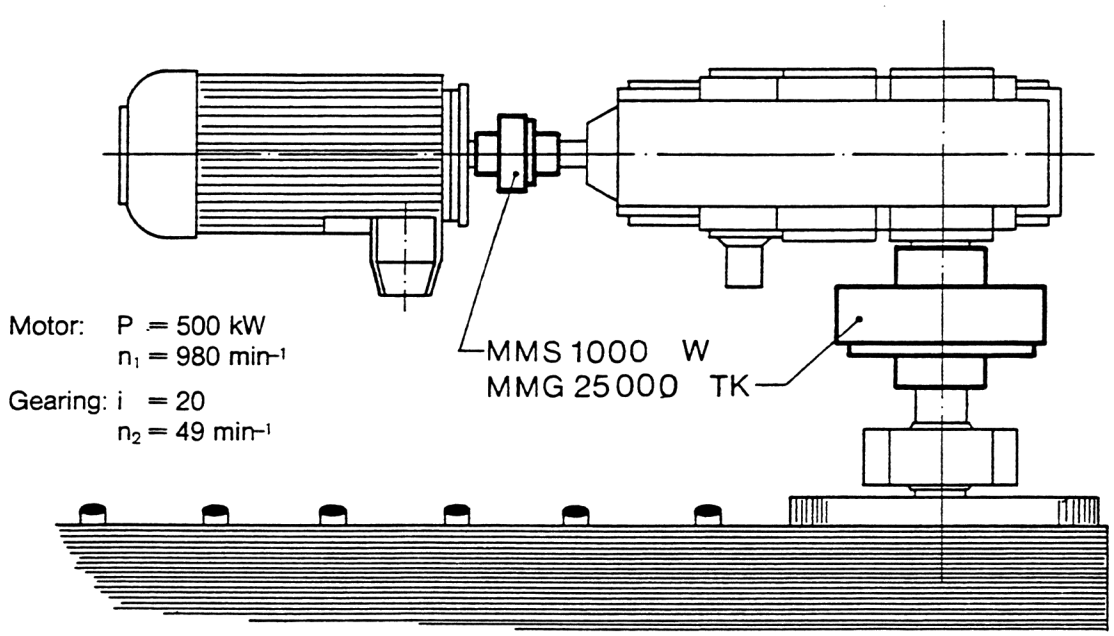
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Sella Couplings

Calculation example — coupling size

Calculation example for determination of the coupling size

The size of coupling for the drive of conveyor belt is to be determined. The coupling is to be installed between an electric motor and the gearing and intermediate gearing and driving drum.



Conveyor belt drive: motor, MMS 1000 W coupling, gearing, MMG 25000 TK coupling and driving drum

The following service factors should be taken into consideration:

- Drive factor for electric motor S_a = 1.0
- Start factor S_z = 1.0
- Temperature factor S_t = 1.1
- Mass factor, conveyor drive for bulk material S_m = 1.4

Coupling between the electric motor and gearing:

$$T_{AN} = 9550 \times P\ (kW) \div n_1\ (rpm) = 9550 \times 500 \div 980 = 4872.4\ Nm$$

Required nominal torque of the coupling:

$$T_{KN} = T_{AN} \times S_a \times S_z \times S_t \times S_m = 4872.4 \times 1.0 \times 1.0 \times 1.1 \times 1.4 = 7503.4\ Nm$$

Selected coupling: MMS 1000 W with T_{KN} = 10 000 Nm

Example for order: 1 off MULTI MONT SELLA coupling type MMS 1000 W

- part 1 g: Bore 120 H7, Keyway DIN 6885/1
- part 1: Bore 100 H7, Keyway DIN 6885/1

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Sella Couplings

Calculation example — coupling size

Coupling between gearing and driving drum:

$$T_{AN} = 9550 \times P\ (kW) \div n_2\ (rpm) = 9550 \times 500 \div 49 = 97448.9\ Nm$$

Required nominal torque of the coupling:

$$T_{KN} = T_{AN} \times S_a \times S_z \times S_t \times S_m = 97448.9 \times 1.0 \times 1.0 \times 1.1 \times 1.4 = 150\,071.3\ Nm$$

Selected coupling: MMG 25000 TK with T_{KN} = 160 000 Nm

Example for order: 1 off MULTI MONT GIANT coupling type MMG 25 000 TK

- part 1: Bore 260 H7, Keyway DIN 6885/1
- part 14: Bore 300 H7, Keyway DIN 6885/1

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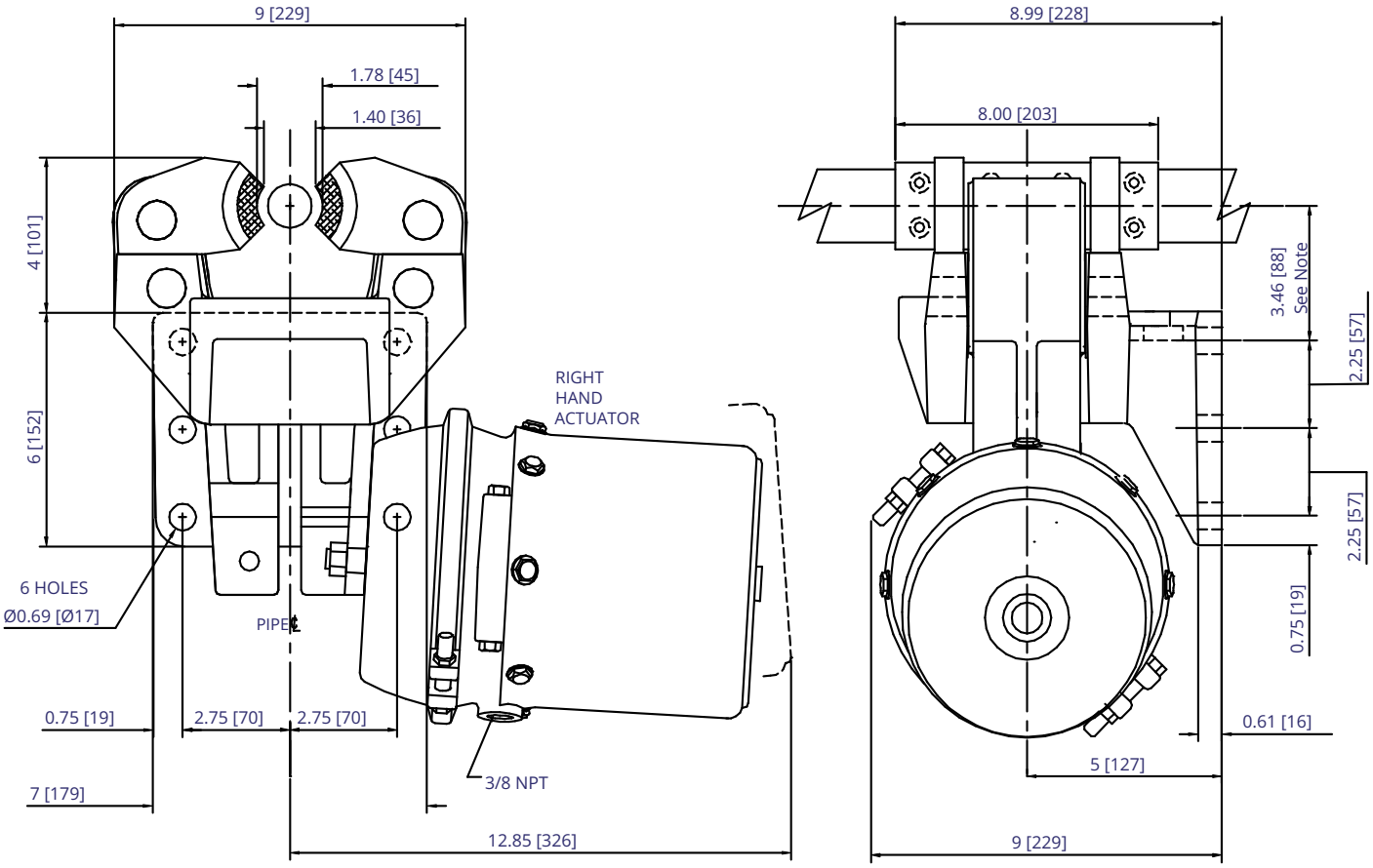
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18HBAX-09P Caliper Brake w/ Pipe Shoe

Spring set / air release · custom build

DRAWING
A5173-1.0



Notes

- CERTIFIED PRINT
- DIMENSIONS: in [mm]
- **Note:** Pipe Locational Tolerance is ± 7/32" Shoes fitted to 1-1/8" pipe
- **CALIPER BRAKE SPECIFICATIONS**
- **MODEL:** 18HBAX CALIPER - FOOT MOUNT, MODIFIED SHOES
- **APPLICATION:** SPRING SET / AIR RELEASE
- **HANDING:** RIGHT HAND ACTUATOR (AS SHOWN)
- **PIPE:** Ø 1-1/8" O.D.
- **NOMINAL TORQUES:**
  – NORMAL FORCE: 15200 LB
  – BRAKING FORCE: 5300 LB (.35 FRICTION)
- **OPERATING PRESSURES:**
  – A. RELEASE- 97 PSI
  – B. HOLD-OFF- 92 PSI
  – C. MAXIMUM- 120 PSI
- **ACTUATOR EXTENSION:**
  – A. NOMINAL- 2"
  – B. MAXIMUM- 2-1/2"
- **OPERATING VOLUMES PER CALIPER:**
  – A. NOMINAL- 86 IN^3
  – B. MAXIMUM- 108 IN^3
- **COATINGS:** ONE COAT SHOP PRIMER PLUS TWO COATS MACHINE ENAMEL (GRAY)
- **APPROXIMATE WEIGHT:** 96 LB / CALIPER
- **QUANTITY:** (2) TWO
- **OPTIONS:**

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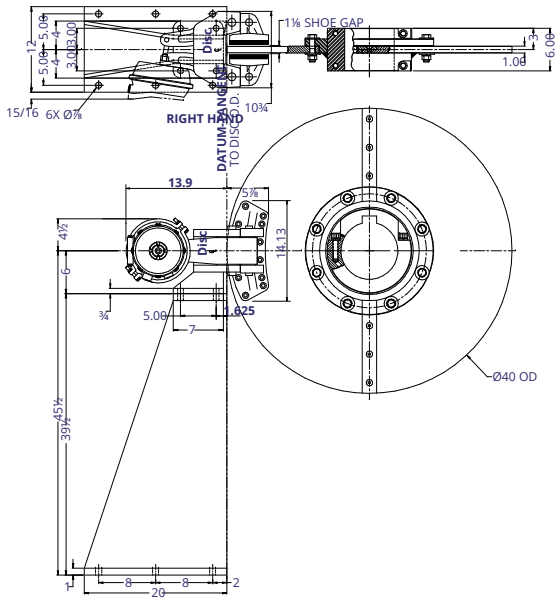
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2836AX Caliper Brake

Air set / spring release · split disc and hub

DRAWING
B4843-01.2



Notes

- **CALIPER BRAKE SPECIFICATIONS**
- **MODEL:** 2836AX CALIPER - FOOT MOUNT
- **APPLICATION:** AIR SET / SPRING RELEASE
- **HANDING:** RIGHT AS SHOWN
- **DISC:** Ø40" × 1.00" THICK (SPLIT DISC & HUB)
- **NOMINAL TORQUE:**
  – A. 18,600 LBS-FT (DYNAMIC)
  – B. 17,800 LBS-FT (STATIC, HOLDING, COLD)
- FRICTION CHARACTERISTICS AND DISC PERFORMANCE ARE SUBJECT TO VERIFICATION ON CUSTOMER'S EQUIPMENT.
- **OPERATING PRESSURES:**
  – MAXIMUM APPLIED: 100 PSI (MAXIMUM)
- **ACTUATOR EXTENSION:**
  – A. NOMINAL- 1"
  – B. MAXIMUM- 2.75"
- **OPERATING VOLUMES PER CALIPER:**
  – A. NOMINAL- 46 IN^3
  – B. MAXIMUM- 127 IN^3
- **COATINGS:** ONE COAT SHOP PRIMER PLUS TWO COATS MACHINE ENAMEL (GRAY)
- **APPROXIMATE WEIGHT:** 163 LB/CALIPER; 317 LB/DISC
- **QUANTITY:** (3) THREE CALIPERS & (3) DISCS
- **OPTIONS:** BRAKE PEDESTAL
- DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE

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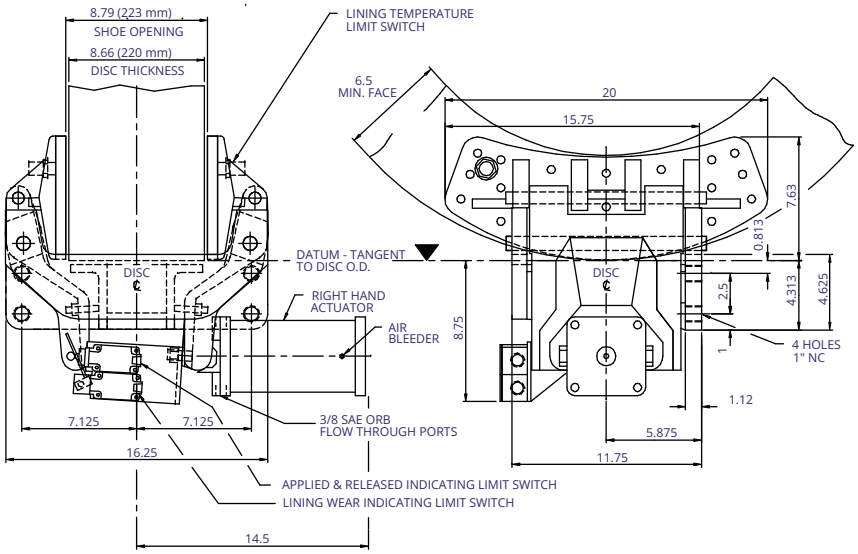
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Y1830SH Caliper Brake

Spring set / hydraulic release

DRAWING
B3447-02.4



Notes

- **CALIPER BRAKE SPECIFICATIONS**
- **MODEL:** Y1830H CALIPER BRAKE, FOOT MOUNT
- **APPLICATION:** SPRING SET / HYDRAULIC RELEASE
- **HANDING:**
  – (1) RIGHT HAND AS SHOWN
  – (1) LEFT HAND (OPPOSITE)
- **DISC:** 220 mm THICK × 1000 mm DIA. FLYWHEEL/DISC
- **NOMINAL TORQUES:** 1,500 N-M PER CALIPER
  – A. 0.3 FRICTION NOMINAL, DYNAMIC
- FRICTION CHARACTERISTICS AND DISC PERFORMANCE ARE SUBJECT TO VERIFICATION ON CUSTOMER'S EQUIPMENT.
- **OPERATING PRESSURES:**
  – A. RELEASE- 625 PSI
  – B. MAXIMUM- 1500 PSI
- **ACTUATOR EXTENSION:**
  – A. NOMINAL- 0.5"
  – B. MAXIMUM- 2.5"
- **OPERATING VOLUMES PER CALIPER:**
  – A. MAXIMUM- 5 IN^3 PER CALIPER
- **COATINGS:** ONE COAT PRIMER AND TWO COATS ENDURA EPOXY PAINT (GRAY)
- **APPROXIMATE WEIGHT:** 265 LB / CALIPER
- **QUANTITIES:** (2) TWO
- **OPTIONS:**
  – APPLIED & RELEASED INDICATING LIMIT SWITCH (NEMA 4X)
  – LINING WEAR INDICATING LIMIT SWITCH (NEMA 4X)
  – ONE (1) ELECTRICAL JUNCTION BOX (NEMA 4X), ENCLOSURE SIZE - 12"X12"X6" (NOT SHOWN)

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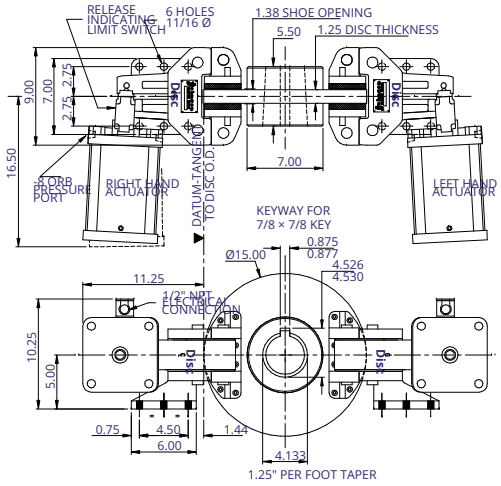
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18HHHX Caliper Brake

Custom build

DRAWING
B4672-01.1



Notes

- **CALIPER BRAKE SPECIFICATIONS**
- **MODEL:** 18HHHX CALIPER - FOOT MOUNT
- **APPLICATION:** SPRING SET / HYDRAULIC RELEASE
- **HANDING:** RIGHT AND LEFT HAND ACTUATOR (AS SHOWN)
- **DISC:** 15" DIA. X 1.25" THICK C/W HUB
- **NOMINAL TORQUES:** TWO CALIPERS
  – A. 11,200 LB-FT
- FRICTION CHARACTERISTICS AND DISC PERFORMANCE ARE SUBJECT TO VERIFICATION ON CUSTOMER'S EQUIPMENT.
- **OPERATING PRESSURES:**
  – A. RELEASE- 1100 PSI
  – B. HOLDOFF- 1000 PSI
  – C. MAXIMUM- 2000 PSI
- **ACTUATOR EXTENSION:**
  – A. NOMINAL- 3/4"
  – B. MAXIMUM- 3"
- **OPERATING VOLUMES PER CALIPER:**
  – A. 14.1 IN^3 MAXIMUM
- **COATINGS:** ONE COAT SHOP PRIMER PLUS TWO COATS MACHINE ENAMEL (GRAY)
- **APPROXIMATE WEIGHT:**
  – 155 LB / CALIPER
  – 105 LB / DISC
- **QUANTITY:**
  – (1) CALIPER WITH RIGHT HAND ACTUATOR
  – (1) CALIPER WITH LEFT HAND ACTUATOR
  – (1) DISC WITH HUB
- **OPTIONS:**
  – RELEASE INDICATING LIMIT SWITCH
- DIMENSIONS: Inches

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Engineering Section

COMBINING MORE THAN 125 YEARS OF BRAKING EXPERIENCE

Johnson Industries Ltd., manufacturers of heavy duty industrial disc brakes and storm brakes, combined forces in March 1993 with the Elevanja electric brake company in the UK. In 1999 a brake distribution and service facility was established in Toronto to service the industrial markets in eastern Canada and the USA. In 2005, Johnson Industries moved to a new 5,600 sq.m. manufacturing, service and distribution facility in Delta.

Johnson's hydraulic, pneumatic, spring-set and manual caliper brakes and brake systems are used worldwide on hoists, drawworks, conveyors, propulsion systems, grinding mills and other types of rotating equipment. Their static and dynamic storm brakes and systems include automatic and manual rail clamps, rail brakes, wheel clamps and wheel brakes for cranes, stacker-reclaimers, ship loaders/unloaders, conveyor trippers and other types of rail mounted equipment.

Elevanja's electro-magnetic and electro-hydraulic thruster drum and disc brakes are in service around the world on cranes, hoists and other materials handling and power transmission equipment. Their products and know-how have long been the accepted technical and quality standard in the UK for nuclear, mining, petro-chemical, steelworks, and general industry.

Johnson and Elevanja now combine more than a hundred and twenty-five years of solid braking experience and now serve the manufacturers and end-users of all types of industrial equipment. Their products and markets are fully complementary and the alliance of the two companies enables them to offer and support a complete range of braking products and integrated brake systems around the globe.

2008/06/30

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Engineering Section

1. GENERAL

1. GENERAL

1.1 COMPANY FACILITIES

Johnson Industries is located in Delta, British Columbia, Canada, approximately twenty minutes from the Vancouver International Airport. Engineering, research, manufacturing, assembly and testing of its products are conducted under one roof. Our U.K. operations are located at Bridgwater, Somerset, approximately 45 minutes south of Bristol. Our Toronto distribution and service center is located roughly 5 minutes from the Toronto Pearson International Airport. Our three facilities employ the latest in CAD and CNC equipment to ensure that we stay at the leading edge of our specialized technology.

1.2 COMPANY PHILOSOPHY

Design

Johnson/Elevanja brakes are used on equipment all over the world. These products are carefully engineered, shop tested, and field proven. Corrosion resistant stainless steel pins, high strength steels and nodular irons are employed to best advantage throughout their design and manufacture. Special corrosion resistant coatings, service accessories, and functional options have been designed to meet special customer needs.

Manufacturing

We strive continually to increase productivity by simplifying our product and streamlining our manufacturing methods. Parts are manufactured wherever necessary to be interchangeable. Components and parts which are replaceable are standardized. All products are thoroughly tested and carefully packed before shipment.

Service

Comprehensive Installation and Service manuals are provided to each customer with the products purchased. We maintain complete records of the manufacturing details of each customer's job. Standard parts are stocked. Personnel are available to attend in the field whenever such a need might arise. Full in-house refurbish and testing facilities are maintained in support of our products.

Research

We are continually seeking new ways to improve our existing products and to devise new ones as the needs arise. Special non-standard requirements are welcomed as an opportunity to innovate and be of service.

1.3 PRODUCTS AND MARKETS

1.3.1 Electrically Operated Brakes

Elevanja shoe and disc brakes are available with magnetic, electro-hydraulic thruster, hydraulic, and pneumatic actuation and are available in either metric or imperial dimensions. The magnetic brakes are spring set and may be released with either DC or AC current, either series or shunt wound. High-torque magnetic and intermediate torque thruster released disc brakes round out the Elevanja range.

Elevanja brakes are used in the following types of machinery:

(a) Stopping brakes on the high-speed end of drives in all types of rotating equipment;
(b) Service and holding brakes in cranes, steel mill service cranes, conveyors, and nuclear fuel handling polar cranes;
(c) Service and emergency brakes for escalators;
(d) On/off and modulated brakes for the travel drives of all types of rail-mounted equipment.

A range of thruster operated band brakes is also available for high-torque applications where heat dissipation is not a critical factor.

1.3.2 Pressure Operated Disc Brakes

Johnson Disc Brake Calipers are available in foot-mount and side-mount configurations. Standard calipers may be actuated either pneumatically, hydraulically, by springs, or manually. Our toggle calipers incorporate a special toggle mechanism which compensates for the actuator spring constant. We manufacture solid steel and ventilated ductile iron discs.

Johnson disc brakes are used in the following types of machinery:

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Engineering Section

1. GENERAL · 1.4 STANDARD WARRANTY

(a) Vehicle parking brakes - spring applied, pressure released, mounted on the drive shaft;
(b) Sluing ring brakes, limited torque, disc mounted and fabricated directly in the sluing ring;
(c) Conveyor holdback or stopping brakes, spring applied, air or hydraulic pressure released;
(d) Marine fixed pitch propulsion system brakes, disc mounted on a shaft coupling, a pair of calipers mounted on a disc diameter, actuation of the brakes controlling shaft rotation during reverse/forward maneuvering, air or hydraulic pressure set;
(e) Log yarder winches and oil rig drawworks, air applied during tensioning and spring applied during shutdown;
(f) Aerospace/aircraft assembly and steel mill service hoists, disc fabricated and machined as part of drum, calipers spring set, high torque, air or hydraulic pressure released;
(g) Mineral Processing SAG and BALL grinding mills;
(h) Oil field drawworks and top drive brakes;
(i) Polar crane hoists, NRC Q/A construction, disc mounted directly on drum, calipers spring set, high torque;
(j) Stopping brakes for rotating machinery such as log chippers, sawmill headrigs, plywood presses, and a variety of other such equipment.

Dynamic wheel brakes and rail brakes have also been developed for use on track-mounted machinery. These devices are similar to our static brakes but employ special bronze alloy shoes which permit dynamic braking at a lower coefficient of friction than that developed by serrated shoes.

1.3.3 Storm & Parking Brakes

Johnson Storm Brakes include rail clamps, rail brakes, and wheel clamps which have hardened tool-steel serrated shoes. They are available in a large variety of mounting configurations and may be spring, fluid pressure, or manually actuated. They are used on most types of track-mounted machinery:

(a) Coal and bulk material stacker/reclaimers;
(b) Belt conveyor trippers;
(c) Cargo handling and container cranes;
(d) Ship loaders/unloaders;
(e) Shipbuilding gantry cranes;
(f) Space vehicle payload cranes.

1.3.4 Other Equipment & Services

(a) Air and hydraulic power units are available to actuate or release our disc and storm braking equipment;
(b) A full range of brake wheels, discs and coupling options;
(c) Electrical controls and accessories for all types of brakes and brake systems;
(d) Related hydraulic, pneumatic and electrical clamping/gripping devices and systems, eg., wheel grippers and web clamps;
(e) Engineering support in the application of our products.

1.4 STANDARD WARRANTY

We warrant our brake products and related equipment to be of the quality specified in our quotations. Performance of products and components incorporated in other equipment and machinery is subject to verification by customer. We guarantee our materials and workmanship for a period of twelve (12) months from date of delivery to the original Purchaser. The Purchaser agrees that our liability in respect of any failure of the goods supplied by us or any loss, injury or damage attributed thereto, shall be limited to making good the repair by replacing and refitting free of charge any goods or parts thereof which are shown to our satisfaction to have been proved, under their intended use, defective in design, materials and workmanship within the twelve-month guarantee period, provided that such defective parts are promptly returned as directed by us, transportation charges being paid by the Purchaser, and provided further that no burning or welding has been done on any such defective goods or parts. In the case of products and components manufactured by others, we extend to the Purchaser the warranties of the manufacturer only. This warranty and guarantee is in lieu of all warranties, conditions, or liabilities implied by law or expressed by statute.

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Engineering Section

2. ELEVANJA ELECTRIC BRAKES

2. ELEVANJA ELECTRIC BRAKES

Elevanja brakes are manufactured to suit the application requirements of Steelworks, Nuclear, Petrochemical, Mining and General industries.

2.1 DESIGN

Elevanja brakes have been designed incorporating over 90 years of experience in brake technology and manufacture. 'D' series brakes are to DIN 15435 metric standards, 'S' series Brakes imperial and/or AISE steel industry standards. 'CU', 'CL', and other Elevanja brakes are manufactured to specific industry standards.

2.2 MATERIALS & QUALITY

The materials used are of the finest grade and specification commensurate with design and safety requirements. Wherever possible bases, shoes, arms, levers and magnet pots are produced from steel fabrications. Tie rods are machined from high quality steel. All pins are made from stainless steel and operate in self-lubricated bushes, thereby reducing maintenance. Linings are asbestos-free and either bonded or riveted to the brake shoes.

2.3 ACTUATORS

2.3.1 Magnets

D.C. magnets may have fixed or removable coils and are short stroke, quick acting with low clapper impact and long life. The coils are potted in epoxy resin, continuously rated for 40 degree centigrade ambient maximum temperature, and are shunt or series wound. Shunt discharge metrosils can be fitted within the terminal box as can a delay diode for some brakes. Suitable rectification components either in-built or in a separate enclosure are also available.

AC magnets are available in single phase or three-phase windings and can be wound in voltages up to 600V. They are supplied for shunt connection only and are suitable for operation from single or poly-phase power supplies, ie; for connection across two lines of a three-phase supply.

Flameproof coils and enclosures may be AC or DC and constructed to BS229 GAS Groups I, II, and III (allow 40% increase in weight for flameproofing).

AC magnet ratings may be intermittent for up to 120 operations per hour for a maximum of 5 minutes out of a 15 minute cycle. Continuous coils operate @ 33% on time with a Class "B" temperature when constantly energized.

2.3.2 Electro-hydraulic Actuators

Our EJ thrusters and EMG's EB & ED thrusters are three phase totally enclosed to IP56 and are supplied filled with fluid. Activation delays to motions may be supplied to order and springs can be fitted within the Thruster.

2.3.3 Fluid Pressure Actuators

All shoe/drum and thruster disc brakes are available with air or hydraulic actuators for releasing spring brakes and setting pressure applied brakes.

2.3.4 Emergency Release - Spring-set Actuators

Most magnetic, electro-hydraulic and pressure operated spring brakes may be released manually, using a lever or jack-screw. Lever released brakes may be provided with either a dead-man or latch-off feature.

2.4 BRAKE MOUNTING

Elevanja brakes may be mounted in virtually any position, subject to specification with order by customer. The footprint and mounting holes may be either to DIN, AISE or other industrial standard.

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Engineering Section

2. ELEVANJA ELECTRIC BRAKES · 2.5 FRICTION LININGS

2.5 FRICTION LININGS

A number of linings are available to accommodate high or low friction or wear requirements, depending on the application parameters, space limitations and system tradeoffs. All of our calipers may be used with either solid or ventilated discs to accommodate heat sink and heat dissipation applications respectively. An example of a heat sink application would be infrequent stopping of a piece of high inertia machinery. The advent of VFD drives has reduced the use of many drive brakes in a service capacity, where the brake pads and mating surfaces stay conditioned; therefore, in these cases additional procedures must be implemented to recondition the brake surfaces as required.

2.6 BRAKE DRUMS & DISCS

Brake discs are available in ductile iron or steel, solid or ventilated. Drums are offered in ductile iron or steel. All discs and drums may be provided with mounting holes, keyed or rough stock bore hubs, or coupling mating elements.

2.7 CONTROLS

Separate electrical panels including rectifier for A.C. supply, brake interlock relays, and resistors enclosed for quick brake release and application are available. Control of several calipers from a common unit is possible when required.

2.8 OPTIONS

Many options are available for the various Elevanja brake series, including:

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Engineering Section

2. ELEVANJA ELECTRIC BRAKES

(a) 'D' and 'S' series brakes - magnetic and thruster:
- wear self-adjusting mechanism;
- limit switches to indicate - brake on, brake off, lining wear;
- various brake releases;
- hydraulic override ('Q' designation, without self-adjustment option);
- weatherproofing and/or assembly enclosures;
- pin lubricators;
- stub pins for brake shoe removal in confined areas (sizes over 315mm, 13 in);
- electronic override on thruster brakes - all sizes.

(b) 'D' and 'S' series brakes - lever or handwheel:
- limit switch;
- lockable handwheel or lever;
- weatherproofing and/or assembly enclosures;
- pin lubricators;
- stub pins for brake shoe removal in confined areas (sizes over 315mm, 13 in).

(c) 'CU' series magnetic disc brakes - e-brake and service brake duty:
- reduced clamping force, increased wear allowance
- some models available with air-gap and pad wear auto-adjustment
- indicating switches for various functions;
- weatherproof housing;
- pin lubricators.

(d) 'CL' series thruster disc brakes:
- thruster with in-built time delay (adjustable);
- thruster with in-built 'C' spring (ie., fixed torque);
- self adjusting device (not available when a 'C' spring is fitted);
- limit switches to indicate brake released condition and other functions;
- hydraulic over-ride ('Q' designation, not available when self-adjusting feature is fitted);
- intermediate disc diameters can be used;
- electronic over-ride on all sizes.

(e) 'CX' series magnetic disc brakes - e-brake duty only
- similar to 'CU' brakes but higher clamping forces
- manual air gap and pad wear adjustment
- indicating switches for various functions;
- weatherproof housing;
- pin lubricators.

(f) 'MBC' series spring set and magnet released balanced torque disc brakes
- AISE and DIN drum brake replacements
- four large brake pads with pairs on opposite sides of the disc
- pure brake couple, no overhung load on shaft
- suitable for motor end or coupling mounted disc

(g) 'TBC' series spring set and thruster released balanced torque disc brakes
- AISE and DIN drum brake replacements
- four large brake pads with pairs on opposite sides of the disc
- pure brake couple, no overhung load on shaft
- suitable for motor end or coupling mounted disc

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Engineering Section

3. JOHNSON DISC BRAKES

3. JOHNSON DISC BRAKES

Johnson calipers are designed and constructed for more than 35 years to provide maximum reliability and maintenance-free service. Their construction includes steel and ductile iron bases, ductile iron levers, either ductile iron or aluminum shoes, and stainless steel pins. Aluminum and manganese bronze levers and shoes are available as options. A number of corrosion resistant epoxy coatings are available for steel and ductile iron components. The two parts which may require occasional replacement are shoe linings and actuator diaphragms or seals.

3.1 DESIGN

Johnson Industries manufactures five types of disc brake calipers. One employs a simple lever system and is referred to as our "Standard Caliper," whether manual, air, hydraulic or spring-set. Another employs a compound lever and toggle system which compensates for the spring constant in spring brakes, maintaining a substantially constant brake force for the full stroke of a spring actuator: we call it our "Toggle Caliper." The third type is our "TL" high-torque free-floating series which may be readily stacked on a disc and utilizes belleville springs in a centrally located actuator; this caliper series is spring-compensated and was developed for use on large regenerative conveyors and mining equipment such as grinding mills. The fourth type is our "Motor Brake" which combines the brake shoes and levers to provide four pads applying a pure couple on the brake disc; these calipers were developed for high-speed drives where electrical thruster and drum brakes may also be used. The fifth range is the floating 'DS' direct acting calipers which employ belleville springs in independent self-contained actuators.

The Standard and Toggle calipers incorporate a single or dual actuator arrangement which places the actuators off to one side; this arrangement reduces the space requirement on the other side of the caliper such that the caliper may be located relatively close to the other structural or mechanical members adjacent to the disc. The TL calipers incorporate the actuator between the levers and are substantially symmetrical. These three caliper types employ a unique mechanical shoe actuation and guide arrangement: a pair of levers actuate and support the shoes while interaction between the shoes and caliper base maintains the shoes substantially parallel to the disc faces.

3.2 MATERIALS & QUALITY

The materials used are of the appropriate grade and specification commensurate with the design and safety requirements of the brakes components and systems. Bases are either ductile iron or fabricated steel and pins are normally stainless steel. Friction linings are non-asbestos and serrated shoes are hardened tool steel. Discs are either steel or ductile iron. All products are subjected to rigorous fit inspection and function testing after assembly and are supported with detailed user installation and service documentation.

3.3 ACTUATORS

Standard air or hydraulic pressure-set actuators are used in most conventional applications where the brake force must be modulated. Spring-set, air or hydraulic pressure released, actuators provide braking in the event of power or pressure loss. Combination air/spring actuators are available to provide variable pressure braking for the normal operation of a machine and spring braking for emergency, holding, or ancillary braking capacity; in addition, the actuator may be used with the standard air chamber deactivated. Spring actuation force varies with spring extension; hence spring torque ratings for Standard calipers are specified at 1" (25 mm) actuator extension and actuators must be adjusted for lining wear if the specified torque rating is to be maintained. Several single actuator calipers are also available with a handwheel for manual operation.

3.4 BRAKE MOUNTING

Standard and Toggle calipers are available in either foot-mounted or side-mounted configurations. The foot-mounted calipers are adapted for mounting on such applications as hoisting equipment, conveyor drives, propulsion shafts, chipper arbors and other pillow-block mounted shafts. The side-mounted calipers are suited to mounting on a frame or bulkhead which is parallel to the disc, such as certain types of hoist drum brakes and sluing drive brakes. The TL calipers may be mounted either way, either singly or in stacked sets. The Motor Brakes are available in foot-mount and 'C'-face electric motor mount.

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Engineering Section

3. JOHNSON DISC BRAKES · 3.5 FRICTION LININGS

3.5 FRICTION LININGS

A number of linings are available to accommodate high or low friction or wear requirements, depending on the application parameters, space limitations and system tradeoffs. All of our calipers may be used with either solid or ventilated discs to accommodate heat sink and heat dissipation applications respectively. An example of a heat sink application would be infrequent stopping of a piece of high inertia machinery. An example of a heat dissipation application is an oil field service rig drawworks or a tensioning winch where a substantially continuous horsepower must be dissipated by the disc.

3.6 BRAKE DISCS

Discs may be solid or ventilated steel or cast iron, depending on the brake system requirements. Normally, discs are provided with machined faces, outside diameter, and inside diameter. The inside diameter is machined to the customer's required tolerances. Mounting holes may be provided as an option, although it is often advisable to drill the disc and mounting spigot holes at the same time, using the same set-up, template, and machine tooling, such as winch drums. Typical mounting arrangements and hub capacities are provided in (**Table D1**) in the **Discs, Wheels & Couplings** section of this catalogue.

Johnson Industries manufactures solid steel and ventilated discs for most brake applications. Typical characteristics and mounting styles, as well as a guide to stopping and tensioning horsepower characteristics, is provided in the drawings in the **Discs, Wheels & Couplings** section. Special purpose discs are either available or may be designed to suit particular requirements. Non-wearing discs may form part of other mechanical elements, such as in the case of holding/emergency brake discs welded directly to a hoist drum.

Mating friction and disc materials, sizing a brake for specific torque or energy dissipating requirements, and adapting caliper mounting details to suit specific application space constraints are as much an art as a science. We will welcome an opportunity to assist you in the selection of the correct disc for your particular requirements. Simply fill out one of the application data sheets in the **PRESSURE OPERATED BRAKES** section and send it to us with your enquiry.

3.7 POWER UNITS & CONTROLS

Johnson Industries offers pneumatic and hydraulic power units for actuating, controlling and releasing caliper brakes. The most common of these power units are illustrated in drawings in the **AIR** and **HYDRAULIC POWER UNITS** sections. Typical complete brake systems are illustrated in the **PRESSURE OPERATED BRAKES** section. They range in size to suit a single small brake to combinations of several brakes, to provide simple on-off control to complex control sequencing and brake torque modulation.

Explosion-proof wiring, quick release valves, special coatings and many other features are available as options on these power units. The manner in which the brakes are controlled will normally depend on the apparatus being braked, as well as the preferences of those designing and/or using the system.

3.8 OPTIONS

- **(a)** Friction Linings - to suit coefficient, wear and temperature requirements
- **(b)** Coatings - various machinery enamels and corrosion resistant epoxies
- **(c)** Self-lubricated pivot pin bushings;
- **(d)** Quick Dump Valves and mufflers for rapid air exhaust and spring/air set
- **(e)** Quick Dump Accumulators for rapid hydraulic discharge and spring/hyd. brake set
- **(f)** Application sequencing for rapid set and ramping up to full brake torque
- **(g)** Closed and Open Loop PLC brake clamping force control
- **(h)** Release and wear limit/proximity switches
- **(i)** Disc/lining temperature instrumentation
- **(j)** Actuator pressure and operating fluid variations

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Engineering Section

4. BRAKE ENGINEERING

4. BRAKE ENGINEERING

Drum or shoe brakes have long been used on hoisting equipment and remain a good choice for many braking applications. Disc brakes are widely used today in machinery such as automobiles, aircraft, off-highway vehicles, cable winding, tensioning, hoisting, drawworks and winching equipment, Heavy Movable Structures such as swing bridges, large-mass rotating industrial machines, and marine propulsion systems. The advantages and benefits of disc brakes over more traditional brakes, such as band, internal shoe, external shoe, double block, and single block, are substantial and varied.

The information and technical data in this catalogue are provided only as a guide to our products and are subject to competent engineering application. Johnson Industries reserves the right to review any application of its products and accepts responsibility for the use of its products only to the extent specified in its written quotations and proposals. Dimensions, clearances, arrangements, and handings are subject to confirmation by way of certified drawings issued subsequent to receipt of an order and customer approved prior to manufacture.

4.1 BENEFITS OF DISC BRAKES

(a) Brake Torque

Disc brakes are inherently non-self-energizing but may be slightly so, depending on the brake pad mounting. Consequently, the braking force and resultant torque are directly proportional to the applied or normal forces of the brake shoes on the disc. This characteristic results in a brake torque which may be smoothly and accurately increased, decreased and controlled. Moreover, these forces are substantially identical in both directions of rotation.

(b) Axial Loads

The normal forces on the brake disc are substantially equal and opposite, the shoes being self-aligning. This feature minimizes axial or thrust loads on the bearings supporting the shaft or coupling upon which the disc is ultimately mounted.

(c) Radial Loads

Where it is essential to minimize overhung or radial loads, a pair of calipers may be mounted on diametrically opposite sides of a disc, thus applying a true couple to the disc. Alternatively, either the MB, FB, MBT, MBC or TBC calipers, which have four pads mounted on two levers, will provide a pure couple and simultaneous actuation.

(d) Energy Dissipation

Many types of band and shoe brakes cover most of the heated area of the brake drum and normally require the heat to be conducted through a mass of material before it reaches an exposed surface. Disc brakes, on the other hand, cover only a small portion of the two disc surfaces. In addition, discs readily lend themselves to ventilation through their center, thus generating air flow through and around the disc in accordance with the fan laws. These factors are most important in brakes where either reliability during continuous applications or reduced fade during short intense braking periods are prime requirements.

(e) Installation

Disc brakes are the answer to many machine design problems. Discs may be mounted on the end of a shaft, on a winch drum spigot, between coupling halves, or as an integral part of another rotating element, such as a hoist drum or grinding mill. Calipers may be mounted virtually anywhere on the disc circumference. Several calipers may be mounted on the same disc. Side-mount calipers may be mounted on a bulkhead parallel to the disc; foot-mount calipers may be mounted on structural elements which are perpendicular to the disc. Each caliper size lends itself to standardization in a family of machines by being adaptable to a range of disc diameters.

4.2 MECHANICS OF DISC BRAKES

(a) Clamping

Disc brakes essentially comprise a rotating disc clamped between two pieces of friction material. The friction force and, hence, the brake torque are directly proportional to the applied equal and opposite forces on the friction pads.

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Engineering Section

4. BRAKE ENGINEERING · 4.3 ELEVANJA DRUM & DISC BRAKES

(b) Friction

Molded and woven organic friction materials today are asbestos-free and are suitable for operating temperatures up to 300 °C (575 °F). The coefficient of friction varies according to the composition and additives in a given formula. In addition, the coefficient of friction varies with the temperature of the mating disc surface and the unit pressure on the lining. For temperatures exceeding 300 °C, sintered and Ferro-ceramic friction materials can tolerate temperatures up to 900 °C (1650 °F).

(c) Wear

Generally, the higher the coefficient of friction, the shorter the wear life of a given friction lining. Abrasive constituents may be added to a lining formula which transfer some of the wear to the disc.

(d) Energy Dissipation

Mechanical brake energy is largely converted into heat at the interface between disc surface and brake lining. This heat is dissipated by conduction to other mechanical parts, by convection to the adjacent air, and by radiation to the surrounding environment. The large exposed areas of a disc used with a caliper brake enhance the convection and radiation processes. Ventilated discs in high speed applications create additional air flow and convection cooling. Further energy is consumed by the mechanical wear of the lining and disc. Forced ventilation improves heat dissipation by controlling the ambient temperature surrounding the disc and caliper.

4.3 ELEVANJA DRUM & DISC BRAKES

4.3.1 General

The Elevanja spring-set brake range includes four distinct styles: magnetic shoe/drum brakes, thruster drum brakes, magnetic disc brakes and thruster disc brakes. In addition, hydraulic and air actuation is available for the drum brakes. A modulated thruster control is available to vary the release thruster AC frequency and impeller RPM and, thereby, modulate the brake torque.

4.3.2 Sector Codes

To meet the material requirements of different industries in the global market, the brake models are prefixed by

- **G** - General Purpose Industrial
- **S** - Steelworks
- **H** - High Integrity for Nuclear Handling (NNC/BNFL/MOD)
- **M** - Flameproof for Mining & Petrochemical

4.3.3 Drum Brake Types (all spring applied unless otherwise stated)

SERIES D - Metric Dimensions to DIN 15435

- DA - DC Magnet - series or shunt wound coil, fabricated steel components
- JDA - DC Magnet c/w shunt wound coil and cast components
- DM - 3-Phase Magnet & Flameproof DC
- DL - 3-Phase Thruster & Flameproof - fabricated steel components
- JDL - 3-Phase Thruster brake c/w cast components
- DQ - Hydraulic applied by foot pedal
- DR - Manual Lever Applied
- DW - Manual Handwheel Applied
- DH - Hydraulic Cylinder Applied
- DPN - Pneumatic Cylinder Applied

SERIES M - Imperial Dimensions

- SMAA - DC Magnet, series or shunt wound, AISE mounting
- SMAC - DC Magnet, shunt wound coil, AISE mounting
- MAA - DC Magnet - NOT AISE mounting
- SMLA - 3-Phase Thruster released, AISE mounting
- SMLB - 3-Phase Thruster released, AISC mounting, cast components

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Engineering Section

4. BRAKE ENGINEERING · 4.4 JOHNSON DISC BRAKES

MISCELLANEOUS

- HP - 1-Phase Contactor
- FA - 1-Phase Flameproof Magnet
- KP - DC Solenoid

4.3.4 Disc Brake Types

- CU 1 to 5 - DC Magnet, series or shunt wound, Service and Emergency Duty
- CU4s to 8 - DC Magnet, series or shunt wound, Emergency Duty
- CX - DC Magnet, series or shunt wound, Emergency Duty
- CL - 3-Phase Thruster Standard IP56 or Flameproof, foot mounted, Service or Emergency Duty
- MBT - 3-Phase Thruster Standard IP56 or Flameproof, motor-end mounted, four pad pure braking couple
- MBC - DC Magnet, series or shunt wound, Service and Emergency Duty
- TBC - 3-Phase Thruster Standard IP56 or Flameproof, foot mounted, Service or Emergency Duty

4.3.5 Discs and Couplings

- DIN - Standard drum diameters - 200, 250 315, 400, 500, 630 and 710 mm
- AISE - Standard AISE diameters - 8, 10, 13, 16, 19, 23, 30
- CPLGS - Pin & Bshg type and Star rubber insert type, with or without disc or drum

4.4 JOHNSON DISC BRAKES

Johnson Industries offers a full range of calipers and discs to serve virtually any brake requirement. A variety of materials are used, including steel, ductile iron, aluminum, and manganese bronze. Quality assurance procedures are employed to verify and provide traceability of all critical materials. What follows is a general description of our brakes. For a complete description of these products see the appropriate catalogue sections.

4.4.1 General

Johnson Standard Calipers are available in four basic sizes and two mounting arrangements. The **800, 1800, 2800** and **3800** series are base-mounting calipers and the **1000, 2000, 3000** and **4000** are side mounting. Each caliper is designed to take a range of actuator sizes and each shoe is shaped for mounting on a range of disc sizes.

Johnson Toggle Calipers include all of the features of the Standard Calipers. The toggle calipers include the **4800, 5800, T5800, 7400, 7600** and **7800** foot-mounted calipers and the **5000, 6000,** and **7200, 8000** series side-mounted calipers. The **TL075, TL150** and **TL250, TL375, TL550, and TL800** calipers may be mounted either way. In addition, the Toggle Calipers employ a unique toggle mechanism which compensates for a variable spring actuator force. This feature is especially adapted to holding brake applications where lining wear might otherwise affect the brake force. These calipers are adapted primarily for spring actuation and holding applications.

Johnson Motor Brakes are low-torque, high-speed lever actuated calipers with an integral shoe and lever. Four brake pads apply a balanced couple to the brake disc. The "FB" brake assembly is foot mounted and the "MB" assembly is mounted on a motor 'C'-Face. In either case, the assembly includes a solid or ventilated disc which may be hub-mounted on a shaft, bolted to a coupling or be an integral part of a coupling half. The disc diameter and thickness are fixed for each caliper.

Johnson 'DS' series brake calipers are for emergency duty on machinery where wear is not a significant factor. For example, a flange disc brake acting directly on the drum of a hoist requires a high torque at a low speed. This range of calipers employs direct acting pistons, either on one side in a floating assembly or opposing with either a floating or fixed mounting. An assembly may consist of a single actuator or several mounted in a single assembly frame. The actuators have their pistons on the outboard end, ie., away from the friction pads, and are completely independent of the assembly and can be removed without impairing the function of the remaining actuators.

4.4.2 Standard Brake Calipers - CPB

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Engineering Section

4. BRAKE ENGINEERING · 4.4.3 Toggle Brake Calipers - SPB & TL

(a) Mounting

- Foot Mount: 800, 1800, 2800, 3800, 4800, 5800, T5800, 7400, 7600 and 7800
- Side Mount: 1000, 2000, 3000, 4000, 5000, 6000, 7200 and 7800

(b) Actuation - pressure or coil springs

(i) Air Actuators - nominal 100 psi (6.8 bar) actuation

- 09, 12, 16 for 800 and 1000 series calipers
- 20, 24, 30, 36 for 1800, thru 8000 series calipers
- 24, 30, 36, 50 for 2800 thru 7800 series calipers

(ii) Hydraulic Actuators - nominal 1000 psi (68 bar) actuation

- 20, 24, 30, 36 for 1800, 2000 thru 7800 series calipers
- 24, 30, 36, 50 for 2800 thru 7800 series calipers

(iii) Spring Actuators - calipers rated @ 1" Actuator Extension

- 12, 16, 24 for 800 and 1000 series calipers
- B, M H, MB, HB for 1800 and 2000 calipers
- M, H, HB, HH for 2800 thru 4000 calipers

(iv) Manual

- 5" Dia. Handwheel for 800 and 1000 caliper
- 8" Dia. Handwheel for 1800 and 2000 calipers
- 10" Dia. Handwheel for 2800 and 3000 calipers

(c) Discs

Discs may vary in diameter and thickness. However, minimum diameters and thicknesses are as follows:

(i) 800/1000 calipers, 15" x 3/4" (381 x 19 mm)
(ii) 1800/2000 calipers, 25" x 1 1/4" (635 x 32 mm)
(iii) 2800/3000 calipers, 30" x 1 3/4" (762 x 44 mm)
(iv) 3800/4000 calipers, 35" x 2" (889 x 51 mm)
(v) 7800/8000 calipers, 50" x 4" (1270 x 102 mm)

Ventilated discs are available for the 1800/2000 through 7800/8000 series calipers.

4.4.3 Toggle Brake Calipers - SPB & TL

(a) Mounting

- Foot Mount: 4800, 5800, T5800, 7400, and 7600 series calipers
- Side Mount: 5000, 6000, 7200 series calipers
- Foot or Side mount: TL075, TL150, TL250, TL375, TL550 and TL800 calipers

(b) Actuation - coil springs and belleville springs

(i) M, H, HB, HH for 4800 thru T5800 calipers
(ii) Spring/hydraulic actuators for 7000 and TL calipers

(c) Discs - Solid

Discs may vary in diameter and thickness. However, minimum diameters and thicknesses are as follows:

(i) 4800/5000 calipers, 30" x 1" (762 x 25 mm)
(ii) 5800/6000 calipers, 40" x 1" (1016 x 25 mm)
(iii) 7200/7600 calipers, 40" x 1 1/4" (1016 x 32 mm)

Ventilated discs are not available for these calipers.

4.4.4 Motor Brake Calipers - FB, MB, MBT

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Engineering Section

4. BRAKE ENGINEERING · 4.5 SERVICE & E-BRAKE BRAKE SELECTION

(a) Mounting

- Foot Mount: FB0800, FB1000, FB1300, FB1600 series calipers
- 'C'-Face Mount: MB0800, MB1000, MB1300, MB1600 series calipers

(b) Actuation - coil springs

(i) Air and Hydraulic Actuators - 100 psi (689 kPa) air, 1000 psi (6890 kPa) hyd.

- 09, 12, 16 for the FB0800/MB0800 & FB1000/MB1000 calipers
- 20, 24, 30 for the FB1300/MB1300 calipers
- 20, 24 30, 36 for the FB1600/MB1600 calipers

(ii) Spring/air & spring/hydraulic Actuators

- 04F, 08F, 12F, 16F and 24F for the FB0800/MB0800 & FB1000/MB1000 calipers
- B, M, MB, HB for the FB1300/MB1300 calipers
- M, H, MB, HB, and HH for the FB1600/MB1600 calipers

(iii) Spring-set, electrohydraulic thruster released

- MB0800, MB1000, MB1300, MB1600 series calipers
- Motor end mount

(c) Discs

Discs have fixed diameters and thicknesses:

(i) FB0800/MB0800 calipers, 8" x 3/4" (203 x 19 mm)
(ii) FB1000/MB1000 calipers, 10" x 7/8" (254 x 22 mm)
(iii) FB1300/MB1300 calipers, 13" x 1" (330 x 25 mm)
(iv) FB1600/MB1600 calipers, 16" x 1 1/8" (406 x 29 mm)

Ventilated discs are not generally available for these calipers.

4.4.5 Direct Acting Spring/Hydraulic Calipers - 'DS' Series

(a) Mounting

- floating to accommodate disc runout or axial position variation
- mounting brackets and pins available
- suitable for mounting in customer's machine structure

(b) Actuation - belleville springs and hydraulic pressure

- single or opposing actuators
- actuators self-contained and ideal for re & re, repair and testing
- up to three (3) single or six (6) opposing actuators in one assembly

(c) Discs - solid

- minimum diameters depend on number of actuators - see data sheets
- integral on customer's equipment or flange mounted
- minimum thickness determined by mounting and thermal input factors

4.4.6 Custom Calipers

We from time to time manufacture special-purpose calipers, such as the direct acting single or opposed-piston type. These calipers are hydraulic pressure applied or spring applied and released by hydraulic pressure. These calipers are intended for less severe application than our standard and toggle calipers, which provide larger friction lining areas and are free-floating. Opposed piston calipers may be rigidly mounted, whereas single piston calipers float.

4.5 SERVICE & E-BRAKE BRAKE SELECTION

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4. BRAKE ENGINEERING · 4.5.1 The Selection Process - See Figure 1

4.5.1 The Selection Process - See Figure 1

(a) Brake **RANGE** is decided by considering the intended Function, braking Requirements, Controls, standard and optional Features, and operating Environment

(b) Brake **TORQUE** capacity is determined to give required stopping for specified duty cycle and all operating conditions, thus determining preliminary brake **SIZE**;

(c) Brake **DUTY CYCLE** is assessed to ensure that lining wear rate is not excessive;

(d) Brake **CONTROL** is determined by application interlock, response and modulation requirements and impact limitations;

(e) Drum or Disc **HEATING** must be calculated to confirm Brake size and thermal limits;

(f) Brake **SIZE** is thus iteratively based on **TORQUE or BRAKE FORCE, DUTY, CYCLE** and disc/drum/caliper **HEATING effects.**

4.5.2 Brake Loads - (basically three types)

(a) Tend to self-stop by friction or windage without a brake - typically horizontal moving masses eg., Crane Bridge, or Gantry (Long Travel) and Trolley (Cross Travel) or rotating elements like Mixers, Rolls and Crane Sluing.

(b) Tend to overhaul and run up in speed if no Brake is fitted - all Downhill Conveyors, Crane Hoists, Winches, Lifts etc. When this type is reversible eg., Hoist and Lower; the load drive-back torque also reverses to assist Brake when load is lifted.

(c) Incrementally increasing inertia and overhauling load, as in the case of a drawworks used on an oil field drill rig tripping in.

4.5.3 Torque Factor - Arbitrary Values

For Type (a) loads a Brake torque of 100% Drive Motor full load is often satisfactory, but if stop time or distance is specified, torque must be calculated with an SF to accommodate the worst case operating and disc/pad conditions. Type (b) loads require a torque component to oppose load driveback in addition to deceleration so that the brake torque is 150 - 200% of motor torque; design brake torque must exceed worst case requirements - once installed brake torque cannot be increased beyond its adjustable range. Type (c) brakes must be controllable to limit impact on light loads but be sufficient to handle maximum loads safely.

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4. BRAKE ENGINEERING · 4.5.4 Duty - Significant Factors

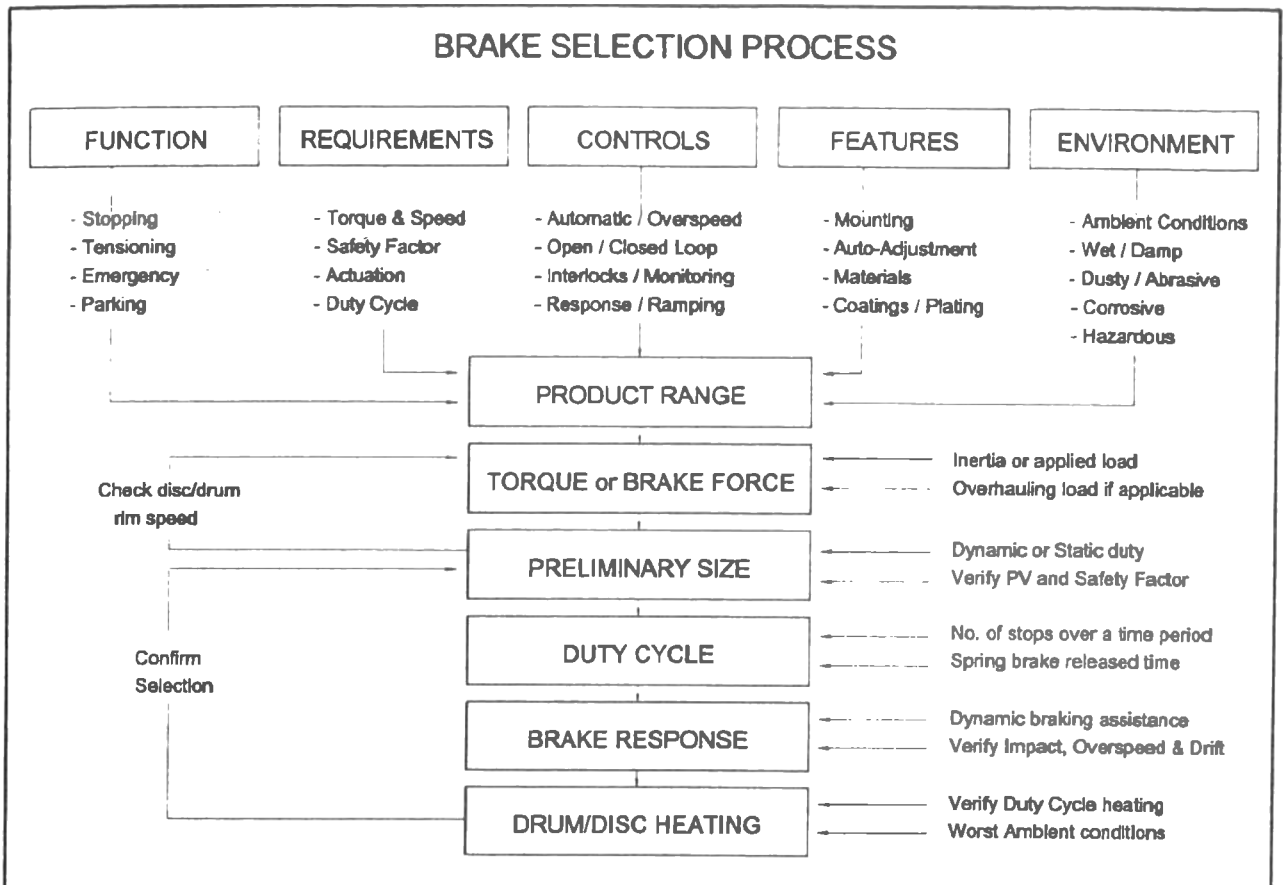


Fig 1 - Brake Selection Process

4.5.4 Duty - Significant Factors

Electrical: Continuously running machines like Conveyors must use 100% rated coils or Thrusters. Some Brakes are listed with intermittent ratings to obtain Higher Magnet output and torques, these are only suitable for drives which will not be run continuously eg; Lifts, Crane Hoists etc.

Mechanical: Light duty AC Clapper and medium duty 3-phase Solenoids tend to hammer and spread the laminated cores at pole face on duties above 240 cycles per hour. It is frequently better to use DC Tractive Magnet or Thruster on high duty-cycle applications.

Thermal: Lining area, braking path and disc/drum mass must be adequate to absorb and/or dissipate stopping energy. Brake discs may operate at higher temperature than drums and may also be ventilated.

Response Times: Quick acting Brakes are AC magnet or DC Tractive Magnet with associated electrical accessories. Slower response is inherent with DC Solenoids or three-phase Thrusters. An adjustable hydraulic delay to about 5 seconds is an option for the latter.

4.5.5 Brake Position and Environment

Environment: For some surroundings, non-standard enclosures or finishes may be needed for protection against ingress of particles and liquid eg., Drip, Weather, Dust, Hose-proof, and Deck Watertight. Some brakes are available for hazardous locations (Flame proof).

Ambient: For temperatures above 40 C special coil ratings and insulation may be required. Silicone and other oils are available to accommodate unusually high or low ambient temperatures.

Mounting: Special Brakes for non-horizontal shafts eg; Vertical Spindle Drive, Tilting Bedplate etc.

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4. BRAKE ENGINEERING · 4.5.6 Brake Application

Shaft Speeds: Listed drum speed is for cast iron for higher speed ductile or nodular iron is used. If steel is necessary, the braking path must have a Brinell Hardness No. of 200 minimum.

Corrosion: corrosion and abrasion resistant materials, treatments, coatings and plating may be required in specific cases.

4.5.6 Brake Application

Selection and proper sizing is the key to the success of any brake installation. Consideration must be given to whether the brake is to be used for:

(a) Stopping - infrequent or cyclical, operation or emergency;
(b) Holding - cold or hot, regularly used, recently burnished or infrequently used and brake surfaces out of condition;
(c) Retarding or tensioning - operating temperature ranges and, duty-cycle/wear limitations;
(d) Combination of any of the above;

Stopping brakes must have sufficient shoe area to provide a satisfactory value of PV (maximum lining pressure X maximum lineal slip speed) during the initial stopping period. Alternatively, the stopping torque may be applied gradually to maintain a substantially constant PV rating. Care must also be taken to ensure that a brake designed to provide a high holding torque either cannot or will not be used to provide a high retarding torque on a disc of limited thermal capacity.

For infrequently used holding brakes, care must be taken to ensure that the disc and lining surfaces retain a burnished condition in spite of non-dynamic use; contamination or corrosion will substantially reduce the friction coefficient between the disc and brake pads. For retarding brakes, care must be taken to ensure adequate thermal capacity in the disc, as well as sufficient lining life on the shoes.

Therefore, as noted previously, the sizing of a brake is something of an art as well as a science, requiring engineering judgment and experience as well as technical knowledge. Accordingly, only a general indication of the technical side of brake design may be conveyed in the following formulas and numbers.

4.5.7 Symbols

		Imperial	Metric
T	= brake torque	lb-ft.	Nm
n	= disc rpm (initial for stopping)	rpm	rpm
WR^2	= rotating inertia,	lb $ft.^2$	kg-m^2
N	= rotating mass initial rpm	rev/min	rev/min
E	= dissipated energy, horsepower	hp	kw
V	= linear speed	ft/sec	m/sec
W	= weight	lb.	kg
t	= stopping time	seconds	seconds

4.5.8 Stopping Torque

(a) Rotating Mass

$$T = 0.00325\ (WR^2)N^2 / (nt)\ \text{lb.ft.} = 0.1047\ (WR^2)N^2 / (nt)\ \text{Nm}$$

(b) Moving Mass

$$T = 0.2965\ WV^2 / (nt)\ \text{lb.ft.} = 9.549\ WV^2 / (nt)\ \text{Nm}$$

(c) The heat sink characteristics of typical solid and ventilated discs are given in the drawings in the **Discs, Wheels & Couplings** section of the catalog.

4.5.9 Energy Dissipation Torque

(a) Constant Horsepower

$$T = 5252\ (HP) / n,\ \text{lb.ft.} = 9549\ (kw) / n\ \text{Nm}$$

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5. STORM & PARKING BRAKES

(b) The heat dissipating characteristics of typical solid and ventilated discs are given in the drawings in the **Discs** section of the catalog.

(c) Special small diameter high-speed discs can be developed to serve special applications.

(d) Special low torque, large shoe area/lining volume calipers are available to provide long brake lining life in continuous applications.

4.5.10 Holding Brakes

Holding brakes should be sized to operate cold, using 80% of the nominal dynamic friction coefficient. Moreover, in applications where the brakes are infrequently used, the linings and disc should be burnished from time to time, to ensure clean mating surfaces between disc and shoe linings. Typical brake control systems are provided in the **PRESSURE OPERATED BRAKE** section for guidance purposes only: the control requirements of each brake application should be carefully considered. Dual pressure/spring actuators may be used to provide a burnishing effect in the "lowering" direction for redundant hoist drum brakes.

4.5.11 Propulsion Brakes

Marine propulsion control systems often employ "shaft" brakes to protect the drive clutch and to assist in maneuvering by bringing the propeller shaft to a complete controlled stop before changing direction. Standard stopping packages for marine propulsion are given in **Table D2** in the **DISCS, WHEELS & COUPLINGS** section for various combinations of Standard calipers, solid discs and shaft speeds. Larger brake packages are available on request. Typical propulsion control systems are illustrated in drawing **SPS01-1.0.**

4.5.12 Dual Brake Service

Dual brakes, employing both pressure and spring actuation, as in the case of a hoist brake, must be designed to ensure:

(a) that the caliper, disc and machinery are protected against excessive compound torque;

(b) the holding torques and dynamic torques are computed using appropriate coefficients of friction for all conditions

4.6 ENGINEERING ASSISTANCE

Johnson/Elevanja will be pleased to assist you in the selection of the best possible combination of standard or toggle brakes to suit your requirements. The information indicated in the Industrial Brake Data Sheet, Propulsion Brake Data Sheet, and Conveyor Brake Data Sheet will assist us in assisting you. In addition, we have developed comprehensive computer programs for determining the optimum disc size and/or ventilation geometry for a given stopping torque or tensioning heat dissipation requirement, whether it be continuous or cyclical.

5. STORM & PARKING BRAKES

Johnson Industries Ltd. manufactures a series of storm brakes ranging in size up to 150,000 lb (667 kN) holding force. Our storm brakes include rail clamps which grip the side of the rail head, rail brakes which push down on the top of the rail head, and wheel clamps which grip the flanges of crane wheels. Our rail clamps employ a unique floating yoke assembly at the rail which accommodates minor lateral movement of the clamp housing with respect to the rail. The yoke assembly also protects the shoes in the rail clamps when they are in their retracted position. The serrated shoes in the rail brakes and wheel clamps retract clear of the clamped surfaces. Regular brake materials and alloyed metal shoes are available for dynamic storm brakes but, typically, the capacity must be derated relative to the holding capacity of serrated shoes.

Our storm brakes are especially adapted to resist wind and other external forces on track-mounted equipment such as bulk material stacker-reclaimers and all types of bridge, gantry and container cranes. The spring set storm brakes automatically set when the equipment is shut down and require either air or hydraulic fluid pressure to be released. A limit switch on each type of storm brake is interlocked with the equipment drive to prevent movement when the brake is engaged. A hydraulic or air flow-control valve is standard on the rail clamps and rail brakes and may be integrated in the control circuit for the wheel clamps.

Each storm brake is supplied as a complete assembled unit ready for easy installation. Our standard assemblies include stainless steel pins, spring actuator, support enclosure structure or frame, limit switch for indicating release, and a standard primer and machinery enamel coating. Optional extras include mating flanges for welding into existing structures, integral bumpers for truck mounted rail clamp enclosures, enclosure doors, explosion-proofing, and special coatings. Multiple assemblies and custom designed frames and enclosures are also available.

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5. STORM & PARKING BRAKES · 5.1 STORM BRAKE ENGINEERING

The **STORM & PARKING BRAKES** section includes a summary of options and specifications for our storm brakes, as well as typical hydraulic control systems for setting and releasing our storm brakes. The **AIR** and **HYDRAULIC POWER UNITS** section provides typical power unit outline dimensions and specifications for your reference. In all cases, the information presented is for estimating and reference purposes only and may be changed without notice. Certified drawings will be provided for each order.

5.1 STORM BRAKE ENGINEERING

5.1.1 References

References which cover various aspects of wind loading and stability of crane like structures are:

(a) ANSI B30.4-1990 - "Portal, Tower and Pillar Cranes";
(b) ANSI B30.2.0-1990 - "Overhead and Gantry Cranes";
(c) ASCE 7-88 1990 - "Minimum Design Loads on Buildings and Other Structures";
(d) Loss Prevention Data Chapter 1-7/April 1983 Factory Mutual System "Wind Forces on Buildings and Other Structures"

5.1.2 Wind Criteria

(a) Basic Wind Speeds

Probably the most important and difficult task in assessing storm brake requirements for a particular track-mounted machine is determining a sensible and realistic value for the wind speed against which the machine is to be secured. Local wind history should be taken into account, along with meteorological data which may be available for the region in question. Several wind contour maps are included at the end of this section for general reference:

(i) United States - Figure 1 - 100 year Mean Recurrence wind speeds 30 ft. above the ground;
(ii) Canada - Figure 2 - 100 year Mean Recurrence wind speeds 30 ft. above the ground;
(iii) United Kingdom - Figure 3 - 50 year Mean Recurrence wind speeds 10 m above the ground.

(b) Basic Wind Force

$$F = q_z G_z C_f A_f \text{, lb; N}$$

- q_z = effective velocity pressure
  - $= 0.00256 K_z(IV)^2$, lb/ft^2
  - $= 0.613 K_z(IV)^2$, N/m^2
- I = structure importance factor, Table 1
- V = wind velocity, mph; m/sec
- G_z = gust response factor @ height z above the ground, Table 2
- K_z = Velocity Pressure Exposure Coefficient @ height z, Table 3
- C_f = shape factor / force coefficients, Tables 4 and 5
- f_a = shape aspect constant = $2.5\ lb^{1/2}$; $1.2\ N^{1/2}$
- D = surface element diameter or least horizontal dimension, ft ; m
- h = surface element height dimension, ft ; m
- z = surface element mean height above ground, ft ; m
- A_f = solid surface area, ft^2 ; m^2
- γ = ratio of solid area/gross area

(c) Exposure Categories

- **A** - city center equivalent, 50 % of surrounding structures higher than 70 ft (21 m);
- **B** - urban/suburban equivalent, numerous closely spaced obstructions;
- **C** - open terrain, scattered obstructions under 30 feet (9 m) in height;
- **D** - flat and unobstructed areas exposed to winds flowing over large bodies of water.

(d) Importance Factor

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5. STORM & PARKING BRAKES · TABLE 1 — Importance Factor I

The importance factor reflects the degree of hazard to human life and potential for damage to property. The ASCE values for the factor I are given in **Table 1**, based on the following criteria:

- **I** - All buildings and structures not included in categories II, III, or IV;
- **II** - Buildings and structures where primary occupancy is for more than 300 people;
- **III** - Essential facilities, structures and equipment in government;
- **IV** - Low hazard, temporary structures.

TABLE 1 — Importance Factor I

Categories	I	
	100 miles from hurricane oceanline and in other areas	At hurricane oceanline
I	1.00	1.05
II	1.07	1.11
III	1.07	1.11
IV	0.95	1.00

TABLE 2 — Gust Response Factors, G_z

Imperial Units					Metric Units				
Height	Exposure				Height	Exposure			
z = ft	A	B	C	D	z = m	A	B	C	D
15	2.36	1.65	1.32	1.15	5	2.31	1.63	1.31	1.15
20	2.20	1.59	1.29	1.14	7.5	2.10	1.55	1.27	1.13
30	2.01	1.51	1.26	1.12	10	1.97	1.49	1.25	1.12
40	1.88	1.45	1.23	1.11	15	1.80	1.42	1.22	1.10
60	1.73	1.39	1.20	1.09	20	1.69	1.37	1.19	1.08
80	1.63	1.34	1.18	1.08	25	1.62	1.34	1.18	1.07
100	1.56	1.31	1.16	1.07	30	1.56	1.31	1.16	1.07
120	1.50	1.28	1.15	1.06	35	1.52	1.29	1.15	1.06
140	1.46	1.26	1.14	1.05	40	1.48	1.27	1.14	1.06
160	1.43	1.24	1.13	1.05	50	1.42	1.24	1.13	1.05
180	1.40	1.23	1.12	1.04	60	1.37	1.21	1.11	1.04
200	1.37	1.21	1.11	1.04	70	1.34	1.20	1.10	1.03

Cranes, stacker/reclaimers, shiploaders and other such heavy mobile track-mounted machinery may reasonably be covered by Importance categories I or III, depending on the nature of the installation and good engineering judgment.

(e) Pressure Centers

Pressure center locations should be computed as accurately as possible for each structural element exposed to the wind. Specific elevation-dependent gust response factors (**Table 2**) and velocity pressure exposure coefficients (**Table 3**), should be applied to each surface element at its particular pressure center when applying the equations for q_z and F in 3.1.2(b).

(f) Gust Response Factors

Gust response factors vary with exposure category and elevation above the ground. The ASCE values, as they would apply to cranes and other types of track-mounted mobile equipment, are given in **Table 2**.

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5. STORM & PARKING BRAKES · 5.1.3 Stability Criteria

TABLE 3 — Velocity Pressure Exposure Coefficients, K_z

Imperial Units					Metric Units				
Height	Exposure				Height	Exposure			
z = ft	A	B	C	D	z = m	A	B	C	D
15	0.12	0.37	0.80	1.20	5	0.13	0.38	0.82	1.22
20	0.15	0.42	0.87	1.27	7.5	0.17	0.46	0.92	1.32
30	0.19	0.50	0.98	1.37	10	0.20	0.52	1.00	1.40
40	0.23	0.57	1.06	1.46	15	0.26	0.62	1.12	1.52
60	0.30	0.68	1.19	1.58	20	0.32	0.71	1.22	1.61
80	0.37	0.77	1.29	1.67	25	0.37	0.78	1.30	1.68
100	0.42	0.86	1.38	1.75	30	0.42	0.85	1.37	1.74
120	0.48	0.93	1.45	1.81	35	0.47	0.91	1.43	1.80
140	0.53	0.99	1.52	1.87	40	0.51	0.96	1.49	1.85
160	0.58	1.05	1.58	1.92	50	0.59	1.07	1.59	1.93
180	0.63	1.11	1.63	1.97	60	0.67	1.16	1.67	2.00
200	0.67	1.16	1.68	2.01	70	0.74	1.24	1.75	2.06

(g) Velocity Pressure Exposure Coefficients

Velocity pressure exposure coefficients vary with exposure category and elevation above the ground. The ASCE values, as they would apply to cranes and other types of track-mounted mobile equipment, are given in **Table 3**.

(h) Shape Factors / Force Coefficients

Solid areas against which wind impinges must be multiplied by shape factors to determine their equivalent values for multiplication by the Effective Velocity Pressures determined in 3.1.2(b). The References contain several approaches and sets of tabulated shape factors C_f which may be summarized for cranes and related structures as follows:

TABLE 4 — C_f - SOLID SURFACES

SHAPE	TYPE OF SURFACE	h/D		
		1	7	25
Square (Wind Normal)	Smooth or Rough	1.3	1.4	2.0
Square (Wind on Diagonal)	Smooth or Rough	1.0	1.1	1.5
Hex. or Oct. $D\sqrt{q_z} > f_a$	Smooth or Rough	1.0	1.2	1.4
Round $D\sqrt{q_z} > f_a$	Smooth	0.5	0.6	0.7
	Rough	0.7	0.8	0.9
	Very Rough	0.8	1.0	1.2
Round $D\sqrt{q_z} \le f_a$	All	0.7	0.8	1.2

TABLE 5 — C_f - LATICED FRAMEWORKS *

γ = Solid Area/Gross Area	Flat Sided Members	Round Members	
		$D\sqrt{q_z} \le f_a$	$D\sqrt{q_z} > f_a$
Less than 0.1	2.0	1.2	0.8
0.1 to 0.3	1.8	1.3	0.9
0.3 to 0.7	1.6	1.5	1.1

Note: * Apply C_f to Solid Area only

5.1.3 Stability Criteria

(a) Overturning Moment

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5. STORM & PARKING BRAKES · 5.1.4 Friction

The fundamental ASME B30.4 - 1990 stability criteria should be followed, i.e., that the overturning moment on a crane should not exceed 77% of the restraining moment. The overturning moment must include the crane load as well as the wind load for operating conditions.

(b) Operating Conditions

Whirley and Revolver type gantry cranes must take into account the worst combination of wind direction, swing angle and boom angle. Container cranes with boom up should be considered with maximum load at the back-reach with the wind approaching off the waterside. Other such worst case criteria should be considered where applicable.

(c) Uplift Forces

Rails are not normally designed to withstand large uplift forces. Accordingly, properly anchored turnbuckle or other tie-downs should be provided to maintain the overturning criteria in (a) for excessive wind or hurricane conditions.

5.1.4 Friction

Various sources indicate that the coefficient of sliding friction between the hard steel surfaces of a crane rail and a crane wheel will range between 0.06 to 0.78, depending on a variety of condition variables. Typical values are:

TABLE 6 — Friction Coefficients

Source	Condition	Static	Dynamic
CRC "Handbook of Tables for Applied Science"	Dry	0.78	0.42
	Greasy	0.11-0.23	0.06-0.19
DIN 120 - CRANES	Rolling		0.02
	Sliding		0.12

Under normal conditions, where corrective measures are taken to maintain reasonably clean rails for normal operation of the crane drives, a dynamic coefficient of friction for sliding of a steel crane wheel on a steel rail might reasonably be taken as 0.10.

The coefficient of friction between a hardened rail or wheel and a storm brake shoe will depend on whether the shoe is serrated, the serration design, inherent hardness or work hardness of the clamped surface, condition of the serrations, and whether the serrations and clamped surface are free of debris. Such values have been found to vary between 0.10 and 0.87 for conditions ranging from worn/corroded serrated shoes to clean rail and crane wheel surfaces. Values for Johnson rail clamps and brakes, and wheel clamps have been verified by tests for substantially new serrated shoes on typical rail/wheel material. It is strongly recommended that the condition of the guide yokes and serrated shoes be carefully monitored through an effective preventative maintenance program. In the event that serrated shoes are inadvertently applied dynamically, they must be inspected and replaced if the serrations have been damaged.

5.1.5 Rail Conditions

For the best results, rails should be in good or as-new condition for the use of rail clamps which clamp the sides of the rail head. Mushrooming or misalignment at joints may damage the rail clamps. Spalling, work hardening, and vertical misalignment may interfere with the operation of rail brakes which push down on the top of the rail head. Frogs and switches in either the landside or waterside rail may preclude the use of rail clamps or brakes altogether. Wheel clamps or braking on every drive and idler wheel may suffice in such cases.

Curves or bumps may be overcome by mounting rail clamps and brakes directly on the bogie frame or equalizer beam, i.e., as close as possible to a wheel. Sufficient space must be allowed on either side of the rail head to accommodate rail clamp jaws.

5.1.6 Code Requirements

ASME B30.2.0-1990 specifies in 2-1.3.1 that an "outdoor crane shall be provided with secure fastenings convenient to apply and to hold the crane against a wind pressure of 30 pounds per square foot" (1436 Newtons per square meter). For wind forces in excess of 30 psf, tie downs, stowage pins, or "remotely operated rail clamps" shall be provided for all positions to supplement the primary braking system. In addition, a "wind indicating device shall be provided" to "give a visible and audible alarm to the crane operator at a predetermined wind velocity."

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5. STORM & PARKING BRAKES · 5.2 JOHNSON STORM BRAKES

5.2 JOHNSON STORM BRAKES

Complete storm brake descriptive material and dimensional data are provided in the STORM & PARKING BRAKES section of this catalog. However, it is pertinent to summarize here the various options available in selecting storm brakes.

Selection and sizing of rail clamps, rail brakes, and wheel clamps, or combinations thereof, should be based on satisfying the Basic Wind Force determined in **5.1** or the code requirements for the given type of equipment and the conditions under which it will operate. Drive brakes may be taken into account for the most economical installation.

(a) Actuation

Johnson storm brakes may be actuated to suit customer preference:

(i) Automatic - Spring-set - either hydraulic or pneumatic release
(ii) Electro-mechanical - Electrically set and released;
(iii) Manual - Handwheel set and released.

Johnson wheel clamps are normally employed on idler wheels, thus their number will normally preclude practical manual or electrical actuation. Accordingly they are automatic, i.e., spring-set, pressure released.

(b) Rail Clamps - spring-set, hydraulic or air pressure released

(i) Clamp the sides of the rail;
(ii) Narrow profile with in-line actuator integrated with mechanism;
(iii) Mounting - end of truck, underside of sill beam, or flange-mounted and built into equipment structure;
(iv) Options - bumper for truck mounted rail clamp, enclosure doors, special corrosion resistant coatings, mating mounting flanges, and integrated hydraulic power unit;
(v) Alternatives - spring-set, air pressure released, manually set and released, and electrically set and released.
(vi) Standard rail clamps mounted on the bogies of conventional track mounted equipment, having level, straight and well maintained rail systems, require lateral float perpendicular to the rail to accommodate the variance between the rail head width and the wheel flange inside width.
(vii) Rail clamps mounted on track mounted radial stackers or shiploaders normally require additional float to accommodate the rail curve, as well as special attention to their location on the end of a bogie or the underside of a sill beam in order to position the rail clamp properly on the rail.
(ix) Rail clamps mounted on the sill beams, midway between the corners and bogied equalizers of large cranes, may

require a secondary vertical float capability to accommodate variation of rail elevation between the bogied corners of the crane;

(x) Rail clamps mounted on track mounted equipment which negotiates curves and straight sections of rail must have sufficient lateral float as well as a rotational degree of freedom about a vertical axis.
(xi) Rail clamps mounted on irregular rail systems, such as on conveyor trippers for mobile leaching bed crawler apparatus, will normally require a third degree of freedom, namely a rocking capability in addition to lateral and vertical float.

(c) Rail Brakes - spring-set, hydraulic pressure released

(i) Push down on top of the rail head - Direct acting or Toggle compensated;
(ii) Profile - low and for narrow space envelopes;
(iii) Mounting - sill beam;
(iv) Options - special coatings, instrumentation, mating mounting flange, custom control systems;
(v) Sizing must take into account uplift and stability as per **3.1.3**.

(d) Wheel Clamps and Brakes - spring-set, hydraulic or air released

(i) Clamps the sides of the crane wheel - normally on idler wheel;
(ii) Mounted on a truck surface or bracket;
(iii) Sizing must take into account uplift and diminished wheel reactions under wind and loaded conditions;
(iv) Fitted with either serrated shoes for parking service or friction material for dynamic duty.

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Engineering Section

6. POWER UNITS

5.3 CONTROL SYSTEMS

Automatic storm brakes may be interlocked with crane truck drives for independent or interlocked operation as indicated in the typical control drawings provided in the **STORM BRAKE** section. Pneumatic or hydraulic release units may be interlocked in a similar fashion. Electro-mechanical storm brakes may be interlocked with crane drives as indicated in drawing ECL01-7.4 in the **Electro-Mechanical** section.

Good practice indicates that outdoor cranes should be shut down in wind velocities in excess of 35 - 40 mph. An anemometer, located at the highest point on the crane should be interlocked with crane drives to ensure that the crane is shut down when wind speeds exceeding a predetermined magnitude are reached.

5.4 ENGINEERING ASSISTANCE

Johnson / Elevanja will be pleased to assist you in the selection of a static brake system for your particular requirements, including the application of the technical data included in this catalog. In addition, we always welcome an opportunity to modify our existing products and to come up with a new solution whenever one is required.

6. POWER UNITS

Johnson/Elevanja offers pneumatic and hydraulic release units for automatic spring-set storm brakes. These power units are specified and illustrated schematically in the POWER UNITS section. They are designed typically to operate on an intermittent (pressure switch) mode and are available with standard or explosion-proof electrical components. They range in sizes suitable for a single disc brake to a plurality of the largest storm brakes we manufacture, depending on the practicability of the required plumbing.

Electro-mechanically set and released rail clamps and brakes are provided with a load-limiting and time-delay circuit module which controls the actuation and release functions.

Johnson/Elevanja Hydraulic and Air Power Units are designed for releasing and/or actuating our disc and storm brakes. A range of power unit sizes are available to accommodate either single caliper brakes and storm brakes or combinations thereof. For example, rail clamps on widely separated tracks may require independent power units (either stand-alone or integral), whereas a pair of rail clamps on one side may be served by a single power unit. The power unit requirements in a given case should be assessed carefully to ensure that the most economical type of unit and the least number of units are employed in each case.

The hydraulic units are recommended for severe operating conditions. The air units are suitable for moderate operating conditions. In many cases, user preference and standardization purposes are governing factors in the selection of either type for a specific application. The standard North American electrical characteristics are 240/480v 3Ph 60 Hz TEFC and the control components are normally single phase 120 VAC. Virtually any other 60 Hz and 50 Hz electrical requirement can be met, including explosion-proofing, to suit a customer's special requirements. Standard coatings are one coat of zinc oxide primer and two coats of machinery enamel; these also may be varied to suit a customer's special requirements.

6.1 HYDRAULIC POWER UNITS

Johnson/Elevanja Hydraulic Power Units normally employ a gear pump direct driven by an electric motor. The electric motor and pump, along with the other system components, may be housed in a vented NEMA 4 enclosure having foot or wall mounting brackets for easy installation in a convenient location. In addition, our motor-mounted power units are specifically suited to integral mounting in rail clamp enclosures.

Standard features of this unit include an internal system leakage compensating accumulator, on-off pressure switch, solenoid dump valve, pressure gauge, relief valve, return line filter, and system bleed-down valve. The reservoir includes a strainer, level switch, sight glass, breather-filler cap, and drain plug. The level switch and pressure switch protect the system components by providing interlock signals to the customer's pump motor starter relay located externally from the power unit itself. Custom power units are available with PLC control and several modes of redundancy to permit continuous operation of production equipment.

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Engineering Section

7. RELATED EQUIPMENT

6.2 AIR POWER UNITS

Standard Johnson Air Power Units typically employ a single stage splash lubricated compressor, belt driven by an electric motor. The electric motor and compressor, along with the other system components are mounted on a foot-mounted horizontal ASME receiver. The standard control system includes a shut-off valve, start-stop pressure control, filter-lubricator-regulator, solenoid dump valve, and belt guard. Typical options include double stage compressors, forced lubrication, constant speed unloader, manual and magnetic starters, after-coolers, dryers, alternator controls, larger receivers, automatic tank drain, and vibration isolator mounts.

7. RELATED EQUIPMENT

We manufacture a number of related products and systems based on brake technology. Noteworthy examples are wheel gripper systems designed to secure rail cars in rotary dumper systems and complete disc brake systems for large regenerative conveyors and grinding mills. Other examples of the types of devices and systems we have supplied are included in the **RELATED EQUIPMENT** section of this catalogue. These examples indicate our willingness to tackle and solve unusual brake problems.

2008/06/30

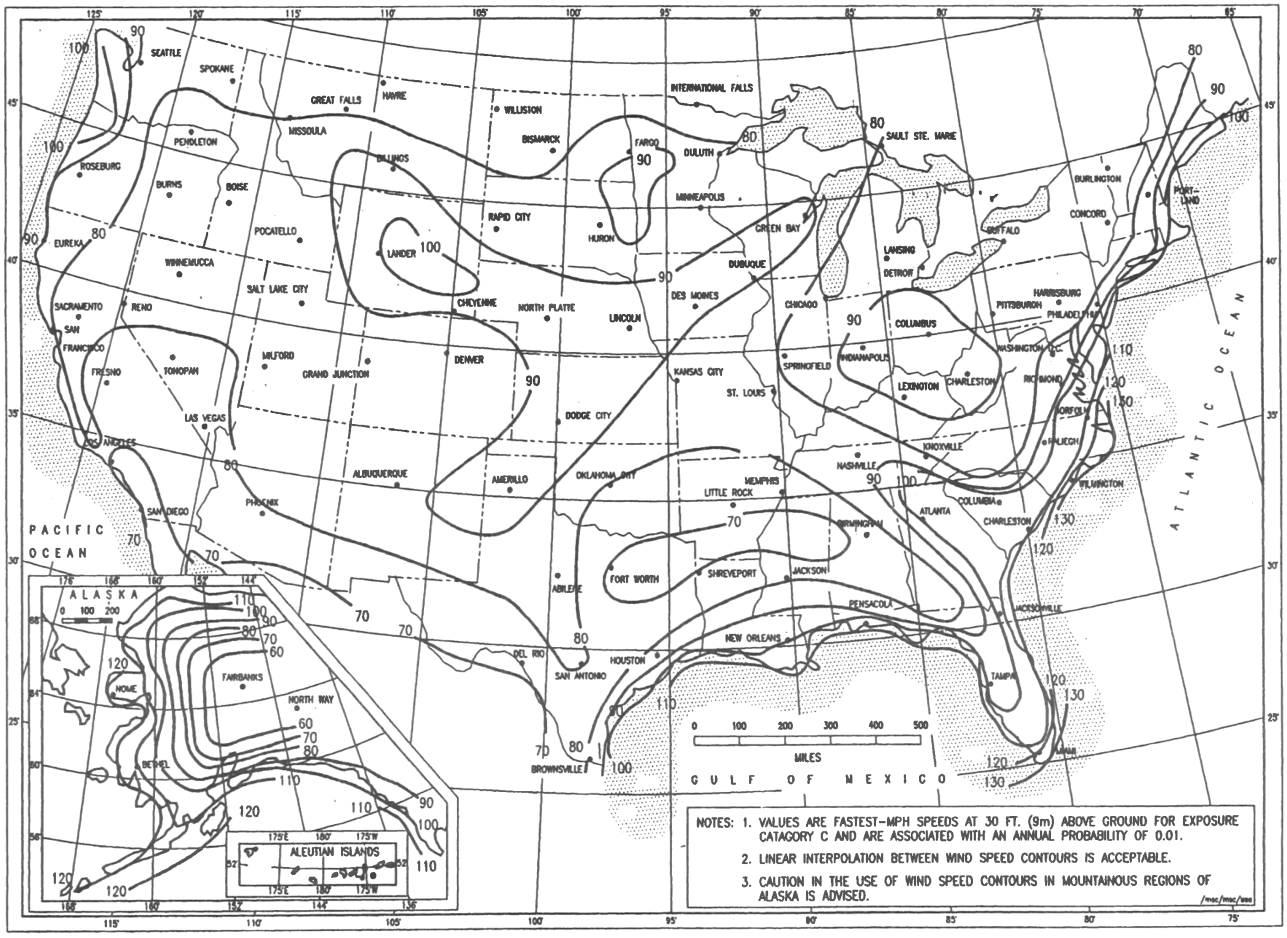


FIGURE 1

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Engineering Section

7. RELATED EQUIPMENT · FIGURE 2

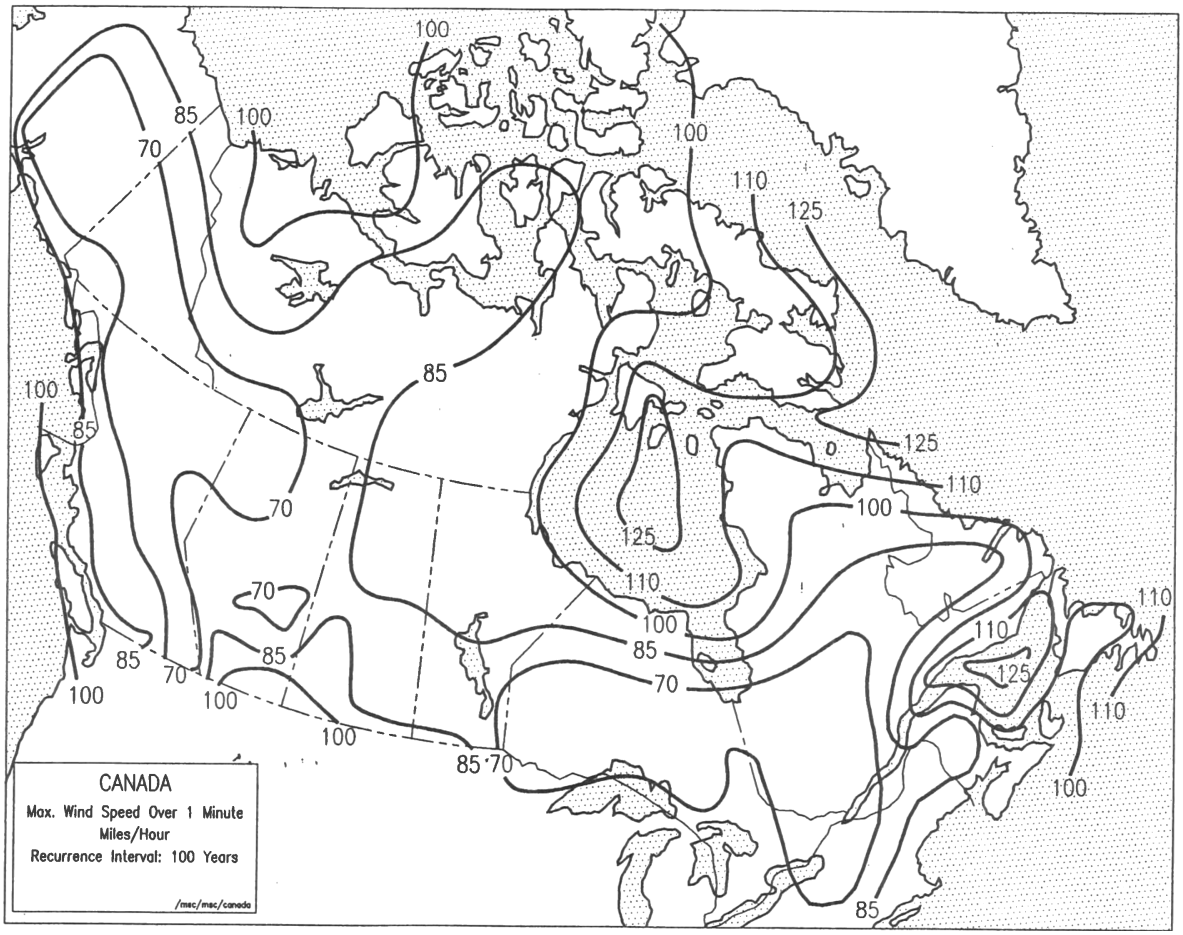


FIGURE 2

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Engineering Section

7. RELATED EQUIPMENT · FIGURE 3

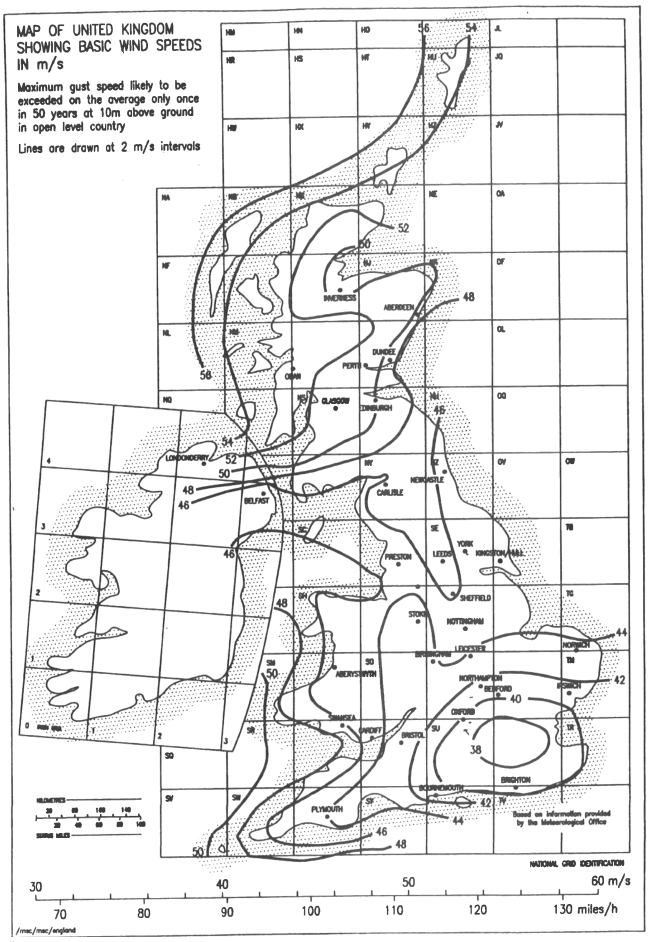


FIGURE 3

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Engineering Section

7. RELATED EQUIPMENT · FIGURE 4

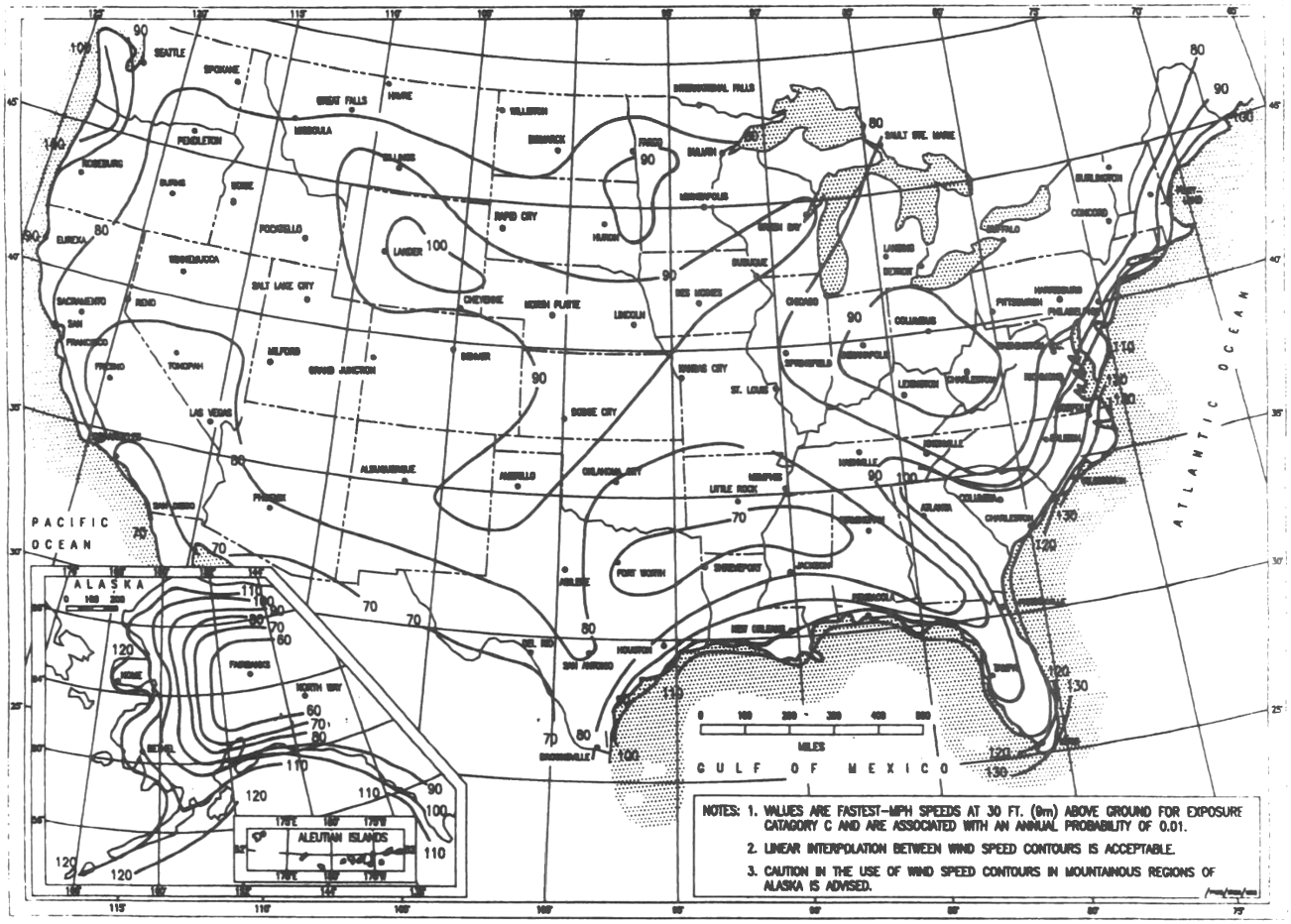


FIGURE 4

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