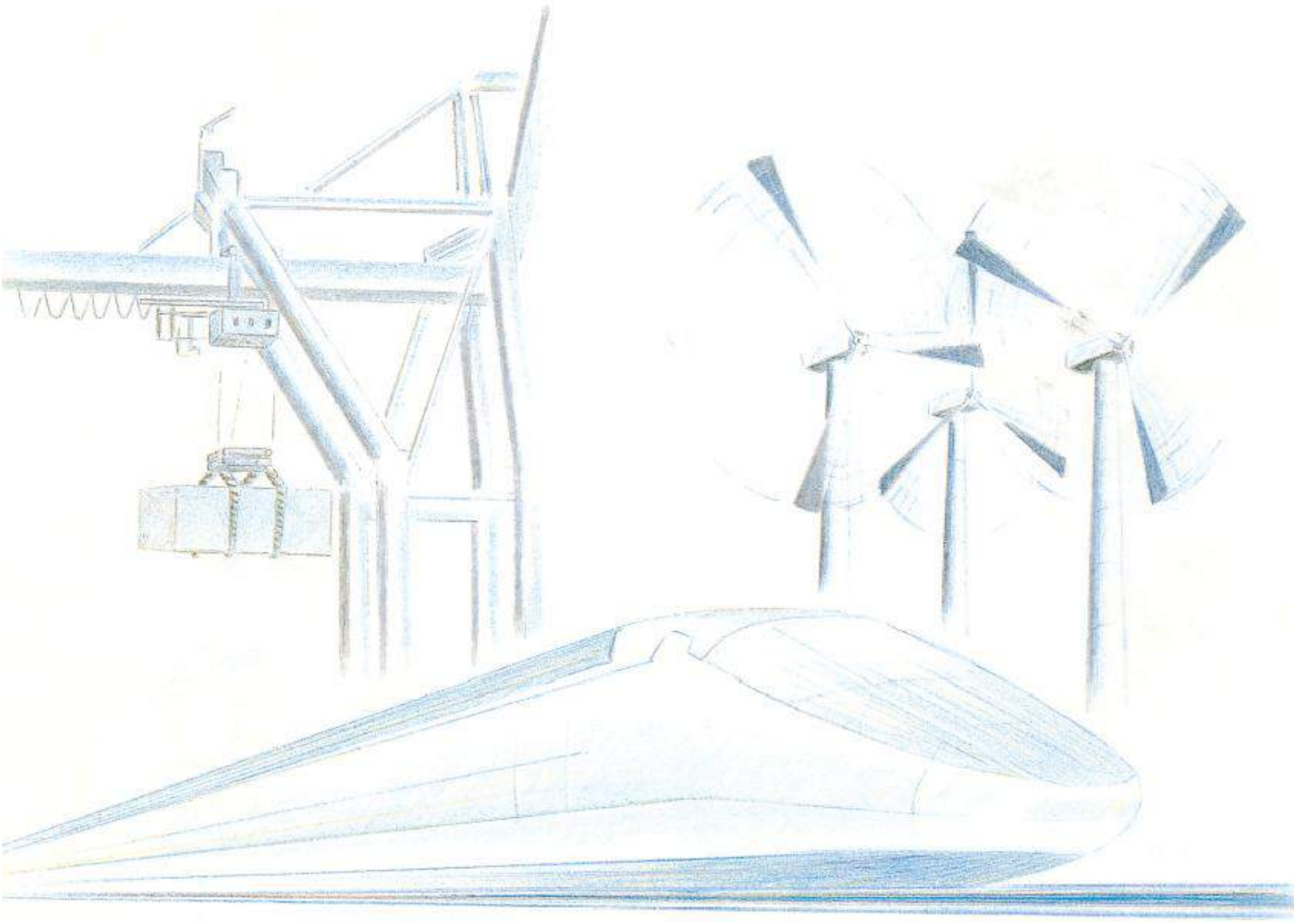
atv Brakes

appareils de transformation de vitesse

www.atv.fr

Industrial disc brakes



SUMMARY

A - Generalities

B - Discs

C - Fail-safe disc brakes

C1 - Electric fail-safe calipers

C2 - Hydraulic fail-safe calipers

Caliper 5 SH	C201
Caliper 450 SH	C202
Caliper 4 SH	C203
Caliper 3 SH	C204
Calipers 15 SH / 30 SH	C230
Calipers 15 SHCI /30 SHCI	C231
Calipers 60 SH / 105 SH	C232
Calipers 60 SHCI /105 SHCI	C233
Emergency brakes S / DS range	Catalogue on request
Thruster brakes	Catalogue on request

C3 - Pneumatic fail-safe calipers

Caliper 5 SP	C301
Caliper 450 SP	C302
Caliper 4 SP	C303
Caliper 3 SP	C304
Caliper ST2 SP	C305
Caliper S9 SP	C306

D - Direct action brakes

D1 - Hydraulic direct action brakes

Caliper 5 ADH	D100
Caliper DADH 10	D101
Caliper DADH 30	D102
Caliper DADH 75	D119
Caliper DADH 350	D122

D3 - Electric direct action brakes

Caliper 5 ADE	D301
Caliper 4 ADE	D302

F - Supplying units

F1 - Electric power suppliers

ESP/ESE 5850 - 6850	F101
ESP/ESE 51850 - 61850	F102
ADC 24V / 48V	F103
APCD 24 B	F104

F2 - Hydraulic power units

Power pack TP3	F201
Power pack CO2R	F210
Power pack ATV114	F230

F3 - Brake monitoring devices

Pad wear detection box	F301
Speed monitoring unit ATVSUR	F302

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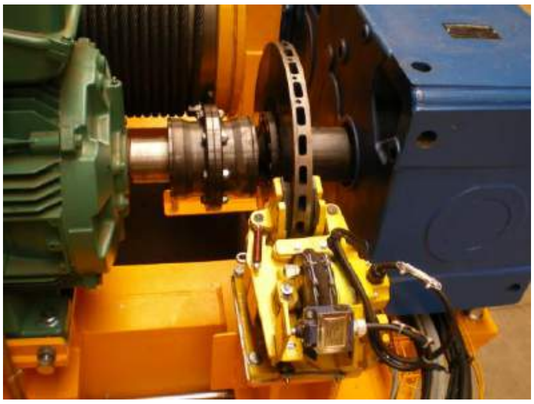
GENERALITIES



A

For over 60 years, ATV has designed and manufactured a complete range of brakes meeting the most stringent specifications of the most demanding industries (iron and steel, nuclear, offshore, military, ski lifts, etc.).

This catalogue covers a wide spectrum of applications including:

- Safe lifting, travel and rotation of overhead travelling cranes, winches and industrial cranes.
- Safe lifting, travel and rotation of port facilities (container ships, cranes).
- Safe lifting for offshore equipment (winches, tensioners).
- Locking and safety for river equipment (sluices, valves, dams).
- Safety/speed regulation in mining (conveyor belts, winches).
- Safe mechanical transport of people (ski lifts, cable cars, merry-go-rounds).
- Safety and locking in energy production (turbines, wind turbines, marine turbines).
- Safety, speed regulation and parking braking for heavy industrial equipment (rolling mills, calenders, centrifuges) and special equipment.

Compliant with the reference standards of all our application sectors, the ATV range is validated by the quality control of major customers, as part of our customer-focused ISO 9001 V2008 certification.

All our digital data (drawings, 3D files) is available upon request.

TYPES OF PRODUCTS:

- FAIL-SAFE BRAKES
- DIRECT ACTING BRAKES
- BRAKE LININGS
- DISCS
- ACCESSORIES

1 - FAIL-SAFE BRAKES

- Braking force is provided by pre-stressing a stack of spring washers or a spring, transmitted mechanically to two friction linings.

  Braking is applied when a fault occurs in a complex mechanical system (breakage of a drive line for example), by cutting off its power supply.

- The range of ATV fail-safe brakes offers several actuator technologies:

Actuator	Product series	Technology	Control
Electric	SE	Electromagnet	Automatic power supplier
Hydraulic	SH	Hydraulic cylinder	Hydraulic unit
Pneumatic	SP	Pneumatic cylinder	Customer network 6 Bar
Electro-cylinder	ST, NC	Electro-cylinder	Customer electric network

- This family of brakes performs two functions:

Service braking:

- For mounting on high-speed drive shaft.
- Suitable for high operating speeds.
- Constant torque guaranteed by automatic lining wear adjustment.
- Short release times.
- Robustness and lean maintenance.
- Large mounting tolerances, due to articulated design.

This function is available for a complete force interval covered by the range 561, 560, 56 in SE series and 5, 450, 4, 3 in SE, SH and SP and SAI3300 series.

Emergency braking:

- For mounting on low-speed drive shaft.
- Release upon fault detection and upon emergency stop.
- Short release times.
- Manual lining wear adjustment.
- Superior robustness and lean maintenance.
- Large mounting tolerances.

This function is available for a complete force interval covered by the ranges:

- ST1, ST2 in SE/SH/SP versions
- 15, 30, 60, 105 SH/SHCI
- S/DS 9, 20, 30, 50, 60, 130, 190, 300 and 400 SH (see specific catalogue)

2 - DIRECT ACTING BRAKES

- Braking force is provided by creating pressure in a cylinder or by using an electromagnetic coil.

- The range of direct acting brakes features several actuator technologies:

Actuators	Product series	Technology	Control
Electric	ADE	Electromagnet	ATV power supply
Hydraulic	ADH	Hydraulic cylinder	Hydraulic unit
Pneumatic	ADP	Pneumatic cylinder	Customer network 6 Bar

- These product ranges perform specific functions:

  - Servo-control of pressure (or of current), providing a progressive, proportional or regulated braking force.
  - Automatic wear adjustment device.
  - Lining retraction function.

3 – BRAKE LININGS

DYNAMIC BRAKING	STATIC BRAKING
Dynamic applications with high friction speed. (5 to 90 $m.s^{-1}$)	Static or dynamic applications with low friction speed. (< 5 $m.s^{-1}$)
All types of friction surfaces (disc/rails, steel/cast iron, etc.)	
Suitable for average disc temperatures of 200°C.	If you need help to choose the right product, please consult our engineers.
Organic and sintered solutions	
All operational conditions of energy dissipation (P V T combinations)	All operational conditions of energy dissipation (P T combinations)
For heavy duty applications, specific proven solutions	For specific static applications (rail safety in earthquake conditions, etc.), specific proven solutions

4 – DISCS

SOLID DISCS	VENTILATED DISCS
Made of steel (thickness 12.7, 15 or 30 mm)	Made of GJS cast iron or steel (thickness 30 mm)
Integrated or separate hub	With low inertia and separate hub
Recommended for emergency or occasional braking	Dissipates braking energy (suitable for cadence braking)
Compliant with French steel industry standard.	

5 – ACCESSORIES

ATV functional offer covers all the above components as well as standard complementary functions:

- Brake open and/or closed monitoring switch.
- Lining wear monitoring switch.
- Manual release detection.
- Hydraulic release device for remote-controlled lowering of a load.
- Special discs (thickness, diameter, material, etc.).
- Braking regulation.
- Module for monitoring overspeed, static/dynamic veering, synchronisation, etc.
- Special control components, etc.

BRAKE DISCS

B

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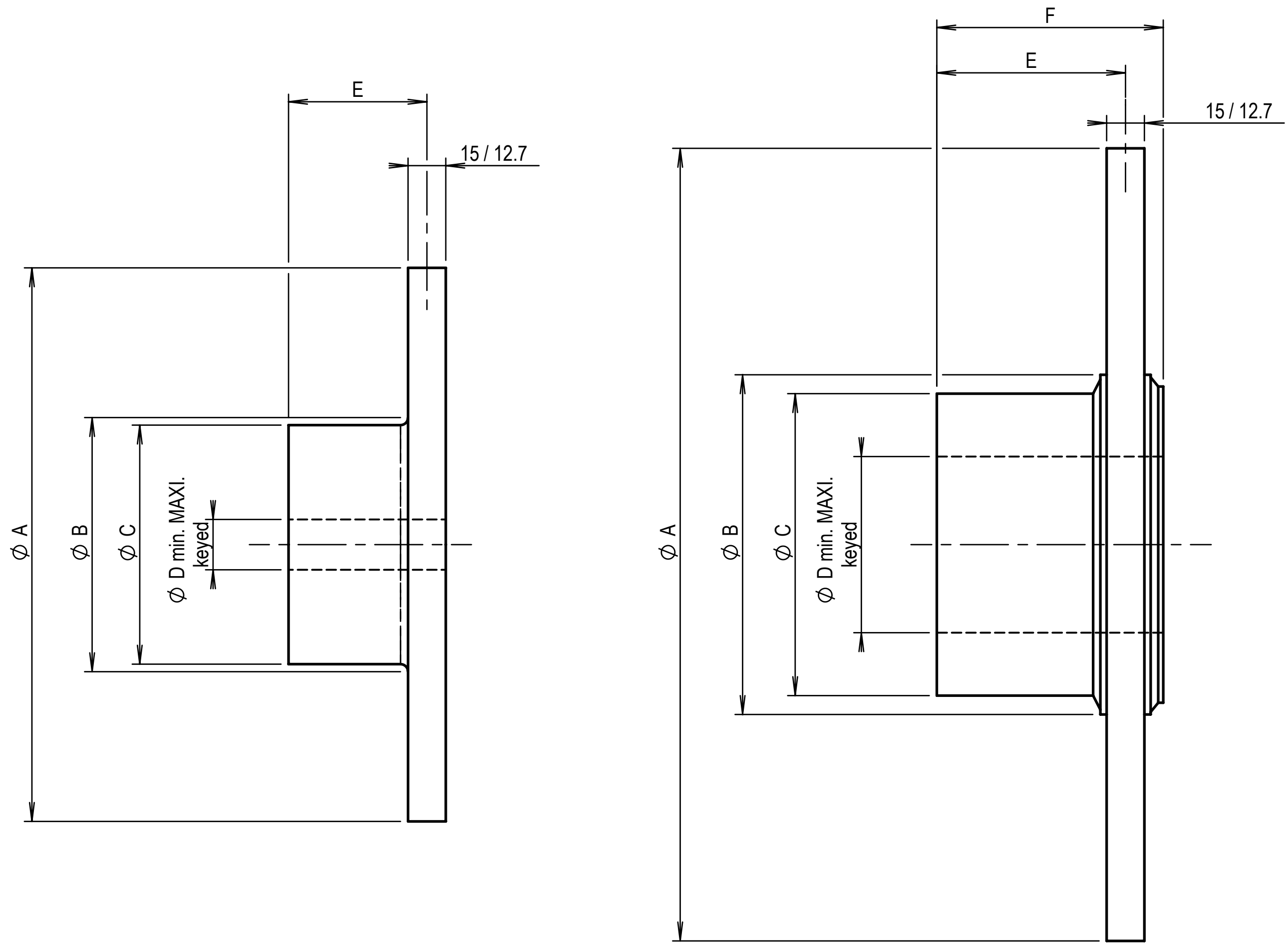
SOLID DISC Thickness 12.7 mm or 15 mm



Dimensions and data open to improvement

DISC TYPE		175	220	260	315	355	395	445	495	550	625
INERTIA	kg/m²	0,013	0,032	0,071	0,139	0,211	0,312	0,482	0,796	1,165	1,931
WEIGHT	kg	4	7	12	15	18	21	24	35	41	52
max. SPEED	rpm	5000	4300	3600	3600	3200	2900	2500	2300	2000	1800
Ø A	mm	175	220	260	315	355	395	445	495	550	625
Ø B	mm	81	101	124	135	170	160	160	215	270	340
Ø C	mm	75	95	110	120	120	120	120	160	160	170
Ø D	mm	15-40	20-55	20-62	20-70	20-75	20-75	20-75	30-100	30-100	30-100
E	mm	45	55	75	75	75	75	75	95	95	95
F	mm	/	/	90	90	90	90	90	110	110	110

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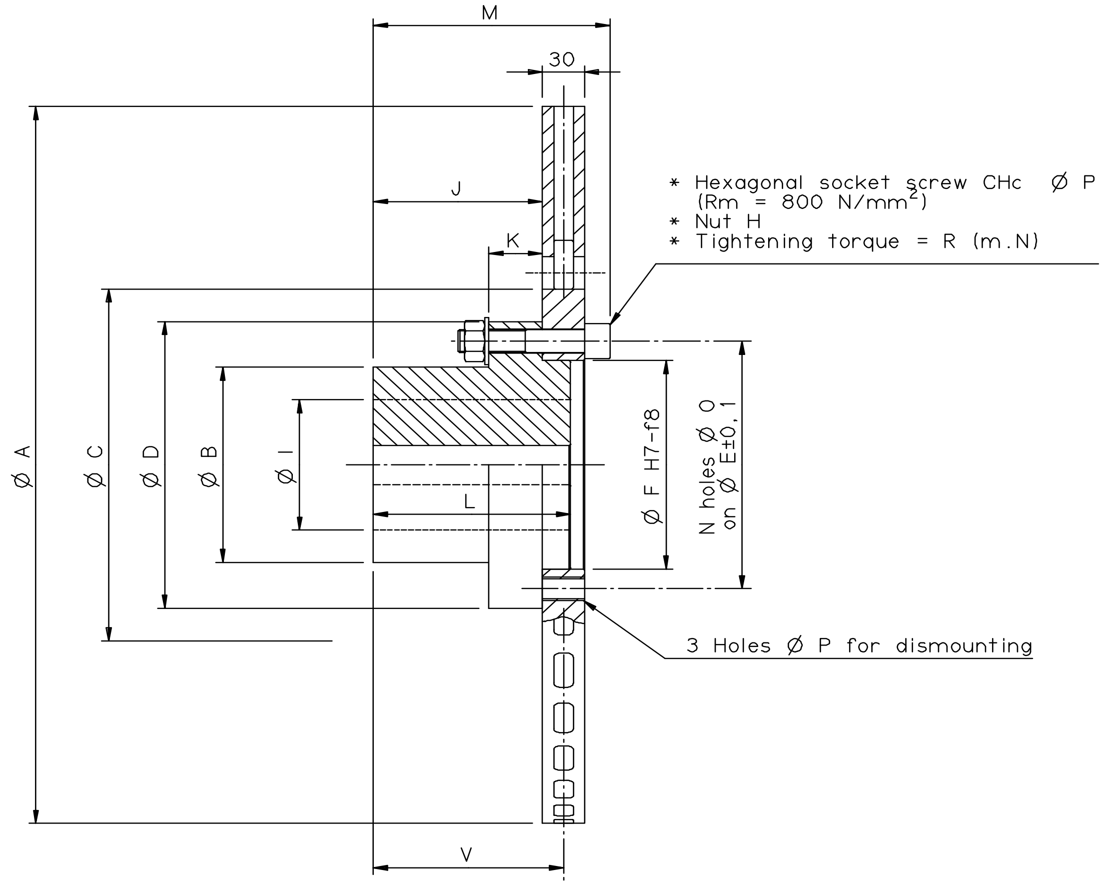
Ventilated or solid DISCS and hub thickness 30 mm



Dimensions and Data open to improvement

		DISC TYPE : 315	355	395	445	495	550	625	705	795
VENTILATED DISCS										
Total INERTIA	kg.m²	0,150	0,245	0,377	0,576	0,946	1,395	2,320	4,015	6,382
Disc INERTIA	kg.m²	0,143	0,232	0,356	0,547	0,855	1,304	2,209	3,818	6,037
Total WEIGHT	kg	15	20	24	31	43	49	62	84	107
Disc WEIGHT	kg	11	14	17	21	26	32	44	59	73
SOLID DISCS										
Total INERTIA	kg.m²	0,234	0,378	0,581	0,933	1,466	2,198	3,632	5,896	9,563
Disc INERTIA	kg.m²	0,227	0,365	0,560	0,904	1,374	2,107	3,521	5,699	9,218
Total WEIGHT	kg	21	27	33	43	56	67	84	108	141
Disc WEIGHT	kg	16	21	26	33	40	50	66	84	107
Max SPEED	rpm	3600	3200	2900	2500	2300	2000	1800	1600	1400
DIMENSIONS and DATA — **Ø A**	mm	315	355	395	445	495	550	625	705	795
Ø B	mm	80	95	105	110	150	150	150	180	210
Ø C	mm	136	174	214	179	270	270	343	418	498
Ø D	mm	125	145	165	175	220	220	235	265	300
ØE	mm	105	125	140	146	190	190	205	230	260
Ø F	mm	85	105	115	120	160	160	170	195	220
Ø I	mm	18-50	18-60	18-70	18-70	30-100	30-100	30-100	40-120	40-130
J	mm	87	87	87	120	120	120	120	120	120
K	mm	28	28	28	30	38	38	38	40	40
L	mm	107	107	107	140	140	140	140	140	140
N		9	9	9	12	12	12	12	12	12
Ø O	mm	10,5	13	15	17	19	19	21	23	25
P	mm	M10	M12	M14	M16	M18	M18	M20	M22	M24
Torque R	N.m	49	86	135	210	290	290	410	550	710
V	mm	102	102	102	135	135	135	135	135	135

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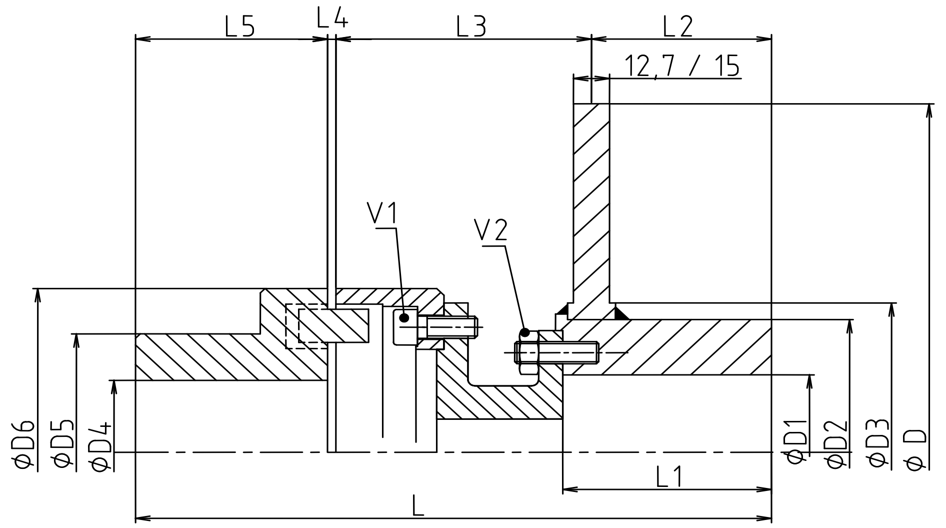
Solid discs thickness 12,7 or 15 mm with flexible coupling FE

Motor side



Receptor side

Dimensions and Data open to improvement

Option: Dismounting without moving machines

DISC Ø D		175		220		260		315			355			395			445				495			550			
Coupling type		97	112	112	128	112	128	112	128	148	128	148	168	128	148	168	128	148	168	194	148	168	194	148	168	194	214
CALIPER TYPE		561 560	561 560 56	561 560 56	561 560 56	561 560 56	561 560 56	561 560	561 560 56 5	561 560 56 5	561 560 56 5	561 560 56 5	561 560 56 5 450	561 560	561 560 56 5	561 560 56 5 450	561 560	561 560 56 5	561 560 56 5	561 560 56 5 450	561 560 56 5	561 560 56 5	561 560 56 5 450	561 560 56	561 560 56 5	561 560 56 5 450	561 560 56 5 450 4
Nom. Torque	N.m	105	167	167	267	167	267	167	267	417	267	417	695	267	417	695	267	417	695	###	417	695	###	417	695	###	###
Max. peak torque	N.m	190	300	300	480	300	480	300	480	750	480	750	###	480	750	###	480	750	###	###	750	###	###	750	###	###	###
J	kg.m²	0,016	0,019	0,038	0,044	0,078	0,083	0,146	0,152	0,161	0,224	0,233	0,256	0,325	0,334	0,357	0,495	0,504	0,527	0,568	0,823	0,846	0,891	1,193	1,216	1,259	1,317
Weight	kg	7,1	8,8	11,8	13,9	17,1	19,1	21	23	26	26	29	35	29	32	38	32	35	41	47	47	53	60	53	59	65	71
	L	173	209	201	219	236	247	237	248	265	248,5	265,5	282	248,5	265,5	282	248	265	281,5	297	295	311,5	327	295	311,5	327	343
	L1	49,5	49,5	59,5	59,5	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	107	107	107	107	107	107	107
	L2	45	45	55	55	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	95	95	95	95	95	95	95
Max. with Key way	D1	44	44	55	55	62	62	70	70	70	70	70	70	70	70	70	70	70	70	70	100	100	100	100	100	100	100
	D2	75	75	95	95	110	110	120	120	120	120	120	120	120	120	120	120	120	120	120	160	160	160	160	160	160	160
	D3	79	79	100	100	124	124	135	135	135	170	170	170	160	160	160	160	160	160	160	215	215	215	270	270	270	270
	L3	75	100,5	82,5	90,5	97,5	98,5	98,5	99,5	106,5	100	107	113,5	100	107	113,5	99,5	106,5	113	118,5	116,5	123	128,5	116,5	123	128,5	134
	L4	3	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	4
	L5	50	60	60	70	60	70	60	70	80	70	80	90	70	80	90	70	80	90	100	80	90	100	80	90	100	110
Max. with Key way	D4	42	48	48	55	48	55	48	55	65	55	65	75	55	65	75	55	65	75	85	65	75	85	65	75	85	95
	D5	69	79	79	90	79	90	79	90	107	90	107	124	90	107	124	90	107	124	140	107	124	140	107	124	140	157
	D6	97	112	112	128	112	128	112	128	148	128	148	168	128	148	168	128	148	168	194	148	168	194	148	168	194	214
Tightening torque																											
V1	N.m	11	16	16	22	16	22	16	22	32	22	32	40	22	32	40	22	32	40	50	32	40	50	32	40	50	80
V2	N.m	14	22	17	27	16	25	16	25	39	22	34	57	22	34	57	23	36	60	96	22	37	60	26	43	69	103

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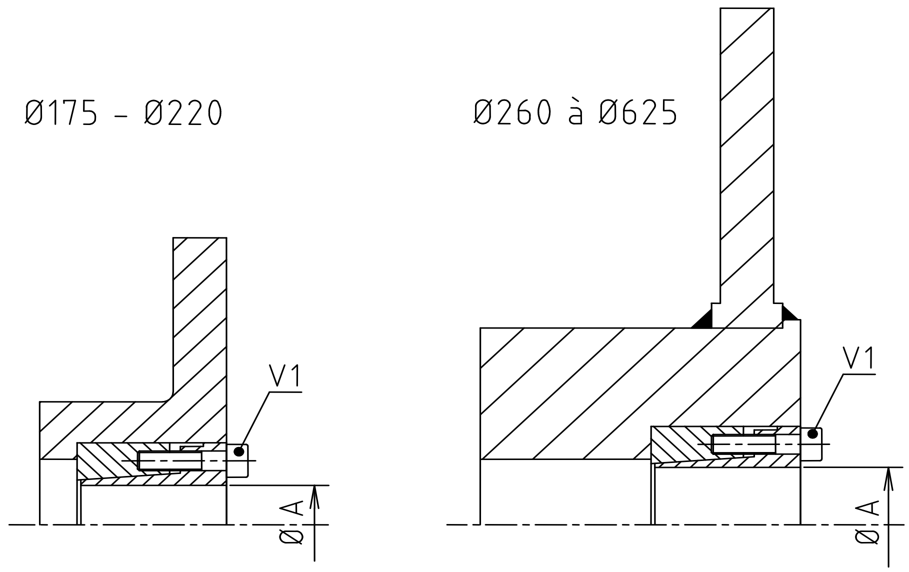
Solid discs Thickness 12,7 or 15mm with shrinked hub SL 5A



Dimensions and Data open to improvement

For discs dimensions - see page B01

Hub SL 5A		20x47	22x47	24x50	25x50	28x55	30x55	32x60	35x60	38x65	40x65	42x75	45x75	48x80	50x80	55x85	60x90	65x95	70x110	75x115	80x120	85x125	90x130	95x135
For shaft Ø A h8		20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90	95
Nom. Torque	N.m	270	300	325	340	380	410	655	720	780	820	1065	1140	1215	1265	2090	2280	2470	3250	3500	3700	4500	4800	6300
Max. torque	N.m	540	600	650	680	760	820	1310	1440	1560	1640	2130	2280	2430	2530	4180	4560	4940	6500	7000	7400	9000	9600	12600
Screws CHC - Nr. of screws x pitch		6xM6	6xM6	6xM6	6xM6	6xM6	6xM6	9xM6	9xM6	9xM6	9xM6	6xM8	6xM8	6xM8	6xM8	6xM8	6xM8	6xM8	7xM10	7xM10	7xM10	8xM10	8xM10	10xM10
Tightening torque V1	N.m	17	17	17	17	17	17	17	17	17	17	41	41	41	41	41	41	41	83	83	83	83	83	83

	Pinces type	20x47	22x47	24x50	25x50	28x55	30x55	32x60	35x60	38x65	40x65	42x75	45x75	48x80	50x80	55x85	60x90	65x95	70x110	75x115	80x120	85x125	90x130	95x135
Disc Ø 175	561-560-56																							
Disc Ø 220	561-560-56																							
Disc Ø 260	561-560-56																							
Disc Ø 315	561-560-56 5-450												NOT STANDARD											
Disc Ø 355	561-560-56 5-450							STANDARD																
Disc Ø 395	561-560-56 5-450																							
Disc Ø 445	561-560-56 5-450-4-3																							
Disc Ø 495	561-560-56 5-450-4-3																							
Disc Ø 550	561-560-56 5-450-4-3																							
Disc Ø 625	561-560-56 5-450-4-3																							

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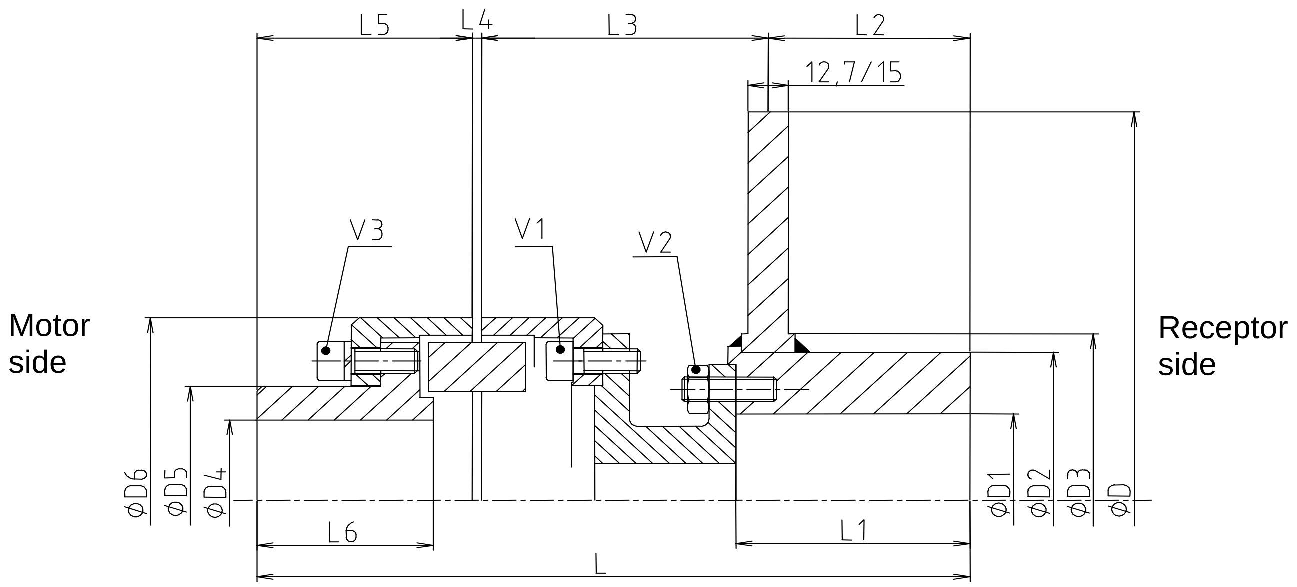
Solid discs thickness 12,7 or 15 mm with flexible coupling FG



Dimensions and Data open to improvement

Coupling replacement without dismounting machines: see manual 170

DISC Ø D		175		220		260		315			355			395			445				495			550			
Coupling type		97	112	112	128	112	128	112	128	148	128	148	168	128	148	168	128	148	168	194	148	168	194	148	168	194	214
CALIPER TYPE		561 560	561 560 56	561 560 56	561 560 56	561 560 56	561 560 56	561 560	561 560 56 5	561 560 56 5	561 560 56 5	561 560 56 5	561 560 56 5 450	561 560	561 560 56 5	561 560 56 5 450	561 560	561 560 56 5	561 560 56 5	561 560 56 5 450	561 560 56 5	561 560 56 5	561 560 56 5 450	561 560 56	561 560 56 5	561 560 56 5 450	561 560 56 5 450 4
Nom. Torque	N.m	105	167	167	267	167	267	167	267	417	267	417	695	267	417	695	267	417	695	###	417	695	###	417	695	###	###
Max. peak torque	N.m	190	300	300	480	300	480	300	480	750	480	750	###	480	750	###	480	750	###	###	750	###	###	750	###	###	###
J	$kg.m^2$	0,016	0,019	0,038	0,044	0,078	0,083	0,146	0,152	0,161	0,224	0,233	0,256	0,325	0,334	0,357	0,495	0,504	0,527	0,568	0,823	0,846	0,891	1,193	1,216	1,259	1,317
Weight	kg	7,5	8,9	11,9	14,0	17,2	19,2	21	23	26	26	29	35	29	32	38	32	35	41	48	47	53	61	53	59	66	71
	L	183	218,5	210,5	229,5	245,5	257,5	246,5	258,5	277,5	259	278	296,5	259	278	296,5	258,5	277,5	296	314,5	307,5	326	344,5	307,5	326	344,5	362
	L1	49,5	49,5	59,5	59,5	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	107	107	107	107	107	107	107
	L2	45	45	55	55	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	95	95	95	95	95	95	95
Max. with Key way	D1	44	44	55	55	62	62	70	70	70	70	70	70	70	70	70	70	70	70	70	100	100	100	100	100	100	100
	D2	75	75	95	95	110	110	120	120	120	120	120	120	120	120	120	120	120	120	120	160	160	160	160	160	160	160
	D3	79	79	100	100	124	124	135	135	135	170	170	170	160	160	160	160	160	160	160	215	215	215	270	270	270	270
	L3	75	100,5	82,5	90,5	97,5	98,5	98,5	99,5	106,5	100	107	113,5	100	107	113,5	99,5	106,5	113	118,5	116,5	123	128,5	116,5	123	128,5	134
	L4	3	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	4
	L5	60	69,5	69,5	80,5	69,5	80,5	69,5	80,5	92,5	80,5	92,5	104,5	80,5	92,5	104,5	80,5	92,5	104,5	117,5	92,5	104,5	117,5	92,5	104,5	117,5	129
	L6	49	58	58	68	58	68	58	68	78	68	78	87	68	78	87	68	78	87	97	78	87	97	78	87	97	107
Max. with Key way	D4	42	48	48	55	48	55	48	55	65	55	65	75	55	65	75	55	65	75	85	65	75	85	65	75	85	95
	D5	54,5	64,5	64,5	74,5	64,5	74,5	64,5	74,5	92,5	74,5	92,5	104,5	74,5	92,5	104,5	74,5	92,5	104,5	121,5	92,5	104,5	121,5	92,5	104,5	121,5	135,5
	D6	97	112	112	128	112	128	112	128	148	128	148	168	128	148	168	128	148	168	194	148	168	194	148	168	194	214
Tightening torque																											
V1	N.m	11	16	16	22	16	22	16	22	32	22	32	40	22	32	40	22	32	40	50	32	40	50	32	40	50	80
V2	N.m	14	22	17	27	16	25	16	25	39	22	34	57	22	34	57	23	36	60	96	22	37	60	26	43	69	103
V3	N.m	10	25	25	25	25	25	25	25	49	25	49	49	22	49	49	25	49	49	49	49	49	49	49	49	49	125

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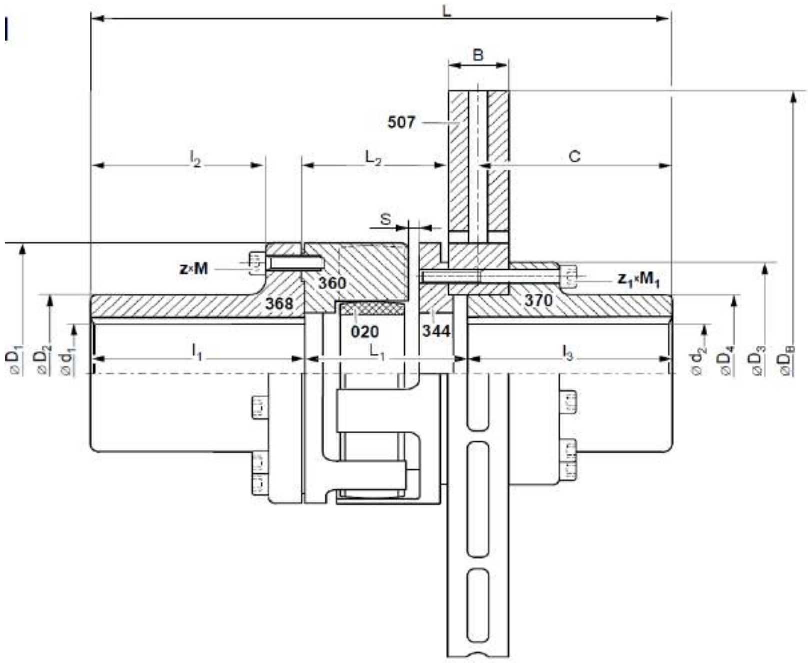
Ventilated discs thickness 30 mm with flexible couplings SDDL-5-BSV



Größe Size Taille	Maße Dimensions Cotes d_{1max} 1) [mm]	d_{2max} 1) [mm]	D_1 [mm]	D_2 [mm]	D_3 [mm]	D_4 [mm]	L [mm]	L_1 [mm]	L_2 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	S [mm]	D_B [mm]	B [mm]	C [mm]
125 - 315V30	55	55	126	80	125	80	286,5	69,5	61,0+2,5	110	96,5	107	5,0	315	30	102
145 - 315V30 355V30	65	55 65	145	92	125 145	80 95	298,0	81,0	72,5+2,5	110	93,5	107	5,0	315 355	30 30	102 102
170 - 400V30 450V30	75	75	170	110	165 175	105 110	331,5 364,5	84,5	76,0+3,0	140	123,5	107 140	5,0	395 445	30 30	102 135
230 - 500V30 550V30	110	105	230	160	220	150	412,5	102,5	95,0+3,5	170	150,0	140	7,0	495 550	30 30	135 135
260 - 550V30 630V30 710V30	125	105 105 125	260	180	220 235 265	150 150 180	469,0	119,0	111,5+4,0	210	185,5	140	8,0	550 625 705	30 30 30	135 135 135
300 - 710V30 800V30 630V42	140	125 150 150	300	200	265 300 300	180 210 210	480,0 480,0 492,0	130,0 130,0 142,0	122,5+4,0	210	183,5	140	8,0	705 795 625	30 30 42	135 135 141
360 - 800V30 630V42	160	150	360	225	300	210	528,5 540,5	138,5 150,5	131,0+4,0	250	220,5	140	8,0	795 625	30 42	135 141
400 - 800V42 1000V42	160	185	400	225	380	260	588,5	158,5	139,0+4,0	250	220,5	180	8,0	795 995	42 42	181 181

Größe Size Taille	Verschraubungen 2) Screw connection 2) Visserie 2) z x M · L_S	M_A [Nm]	z x M_1 · L_{S1}	M_{A1} [Nm]	Drehmoment (Vk60D) 1) Torque (Vk60D) 1) Couple (Vk60D) 1) T_{KN} [Nm]	T_{Kmax} [Nm]	Drehzahl Speed Vit. de rotation n_{max} [min-1]	Gesamtmasse 3) Total weight 3) Poids total 3) [kg]
125 - 315V30	9 x M10 · 25	49	9 x M10 · 70	49	370	1100	3000	24,0
145 - 315V30 355V30	9 x M12 · 30	85	9 x M10 · 70 9 x M12 · 75	49 85	600	1800	3000 2700	27,6 32,0
170 - 400V30 450V30	12 x M12 · 30	85	9 x M14 · 75 12 x M16 · 80	135 210	950	2850	2400 2100	44,6 51,5
230 - 500V30 550V30	15 x M14 · 35	135	12 x M18 · 90	300	2580	7740	1800	93,0 99,0
260 - 550V30 630V30 710V30	15 x M16 · 40	210	12 x M18 · 90 12 x M20 · 95 12 x M22 · 100	300 425 580	3980	11940	1800 1500 1300	121,5 135,8 158,8
300 - 710V30 800V30 630V42	15 x M20 · 50	425	12 x M22 · 100 12 x M24 · 100 12 x M24 · 110	580 730 730	5850	17550	1300 1200 1400	181,0 210,9 185,8
360 - 800V30 630V42	12 x M24 · 55	730	12 x M24 · 100 12 x M24 · 110	730	9700	29100	1200 1400	256,7 231,6
400 - 800V42 1000V42	14 x M24 · 55	730	12 x M30 · 120	1450	13350	40050	1000 900	327,0 427,0

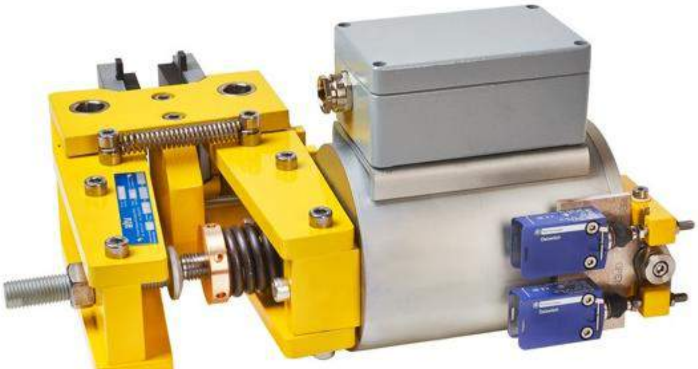
1) Tragfähigkeit der Welle-Nabe-Verbindung überprüfen.
2) Schrauben nach DIN 912 - Festigkeitsklasse 8.8 mit Anziehdrehmoment M_A bzw. M_{A1}
3) Gesamtmasse ungebohrt

1) Examine the load capacity of the shaft-hub connection
2) Screws and bolts to DIN 912, strength class 8.8 with tightening torque M_A or M_{A1}
3) Total weight unbored

1) Vérifier la limite de charge du raccord arbre-moyeu
2) Boulons normalisés DIN 912, classe de dureté 8.8, couple dynamométrique M_A ou M_{A1}
3) Poids total non alésé

Dimensions and Data open to improvement

FAIL-SAFE DISC BRAKES



C

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ELECTRIC FAIL-SAFE CALIPERS

C1

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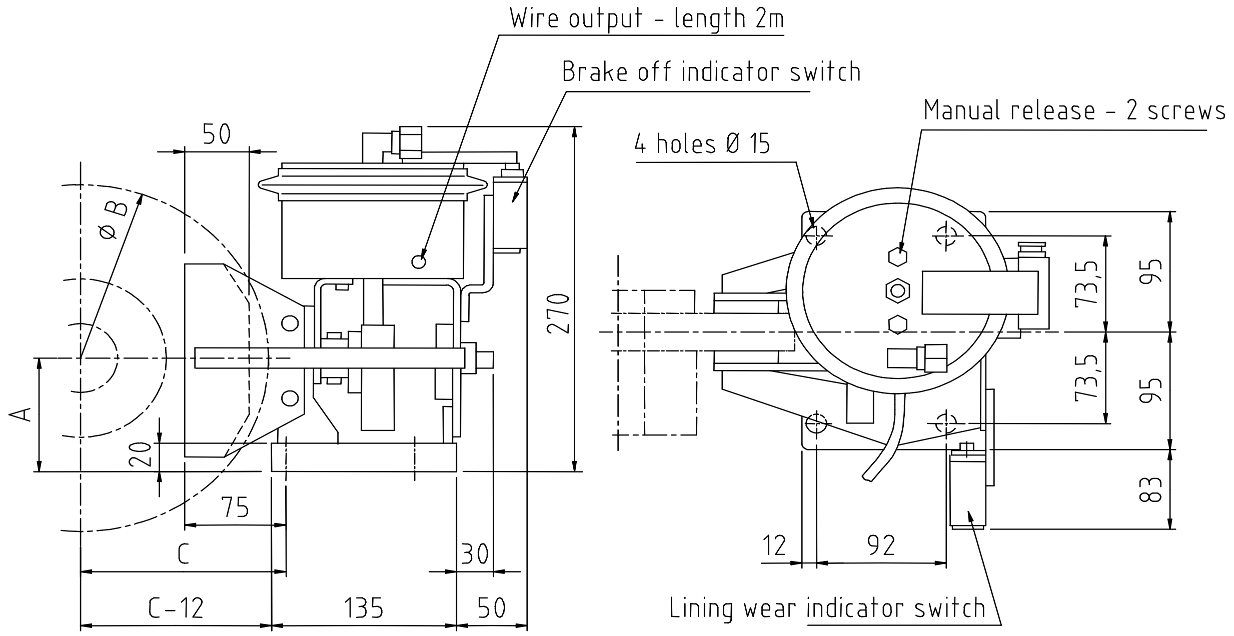
561 SE

FAIL SAFE BRAKE

Spring braking - Electric release - Disc thickness: 12,7 to 30 mm



Dimensions and Data open to improvement

Caliper to be mounted on right or left side

With automatic lining wear adjustment (REF : 561 SE)

Without automatic lining wear adjustment (REF : 561 SERM)

The brake must work with an automatic power supplier (type ESE or ESP)

Brake disc diameter ØB	mm	175	220	260	315	355	395	445	495	550	625
Braking torque	N.m	40	50	60	80	90	100	120	140	150	180
Braking force	N	640	Adjustable from 50% to 100%								
Max Reaction force	N	1 Caliper : 640 N - 2 Calipers : 0 N									

CALIPER	*C (mm) = (ØB)/2+20*	(Formula for non standard discs)									
Power consumption	W	Release 255 W, Hold : 7 W									
Response time	s	0,15									
Weight	kg	20									
A	mm	85									
C	mm	118	130	150	178	198	218	243	268	295	333

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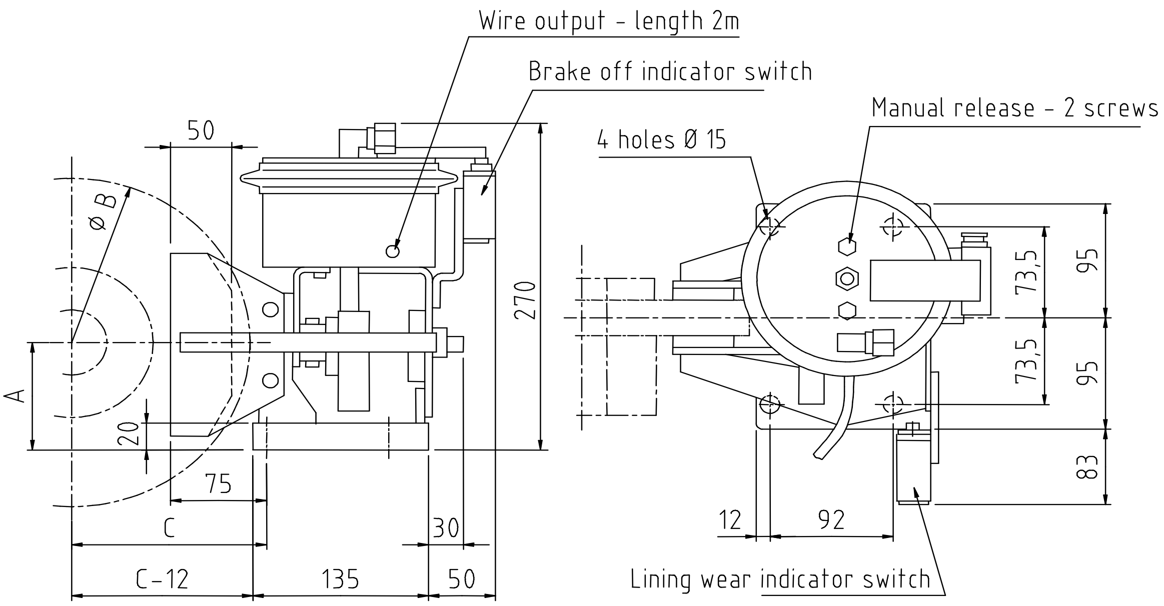
560 SE

FAIL SAFE BRAKE

Spring braking - Electric release - Disc thickness: 12,7 to 30 mm



Dimensions and Data open to improvement

Caliper to be mounted on right or left side

With automatic lining wear adjustment (REF : 560 SE)

Without automatic lining wear adjustment (REF : 560 SERM)

The brake must work with an automatic power supplier (type ESE or ESP)

Brake disc diameter ØB	mm	175	220	260	315	355	395	445	495	550	625
Braking torque	N.m	80	90	120	150	170	200	230	265	280	340
Braking force	N	1220	Adjustable from 50% to 100%								
Max Reaction force	N	1 Caliper : 1220 N - 2 Calipers : 0 N									

CALIPER *C (mm) = (ØB)/2+20* (Formula for non standard discs)

Power consumption	W	Release 310 W, Hold : 8 W									
Response time	s	0,15									
Weight	kg	20									
A	mm	85									
C	mm	118	130	150	178	198	218	243	268	295	333

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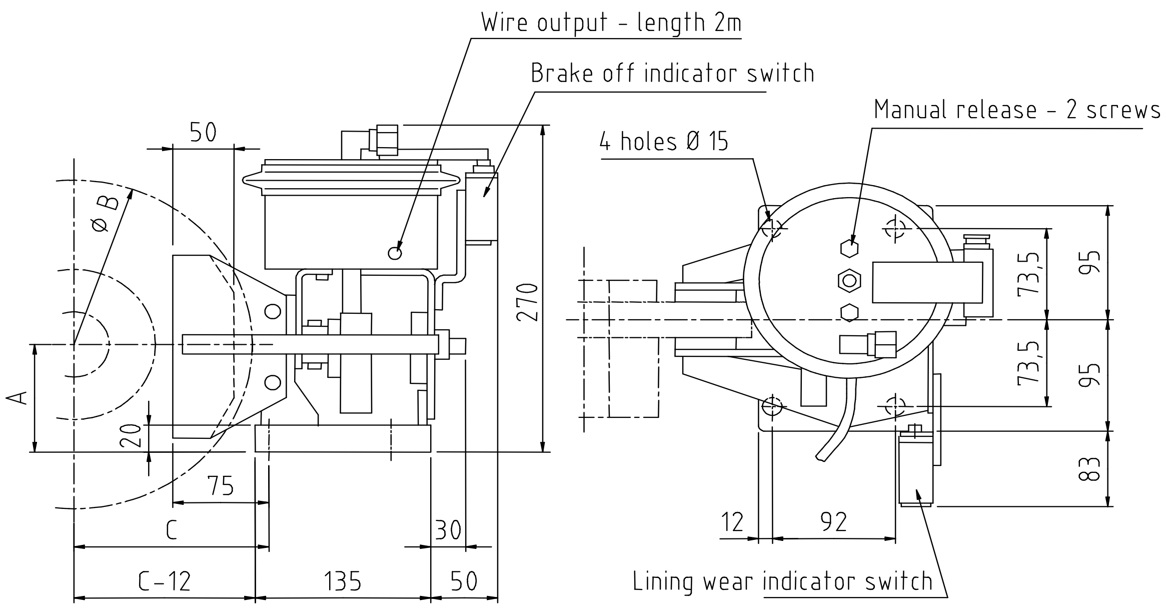
56 SE

FAIL SAFE BRAKE

Spring braking - Electric release - Disc thickness: 12,7 to 30 mm



Dimensions and Data open to improvement

Caliper to be mounted on right or left side

With automatic lining wear adjustment (REF : 56 SE)

Without automatic lining wear adjustment (REF : 56 SERM)

The brake must work with an automatic power supplier (type ESE or ESP)

Brake disc diameter ØB	mm	175	220	260	315	355	395	445	495	550	625
Braking torque	N.m	110	130	150	190	220	260	300	350	390	440
Braking force	N	1600 Adjustable from 50% to 100%									
Max Reaction force	N	1 Caliper : 1600 N - 2 Calipers : 0 N									

CALIPER	*C (mm) = (ØB)/2+20* (Formula for non standard discs)										
Power consumption	W	Release 895 W, Hold : 33 W									
Response time	s	0,15									
Weight	kg	20									
A	mm	85									
C	mm	118	130	150	178	198	218	243	268	295	333

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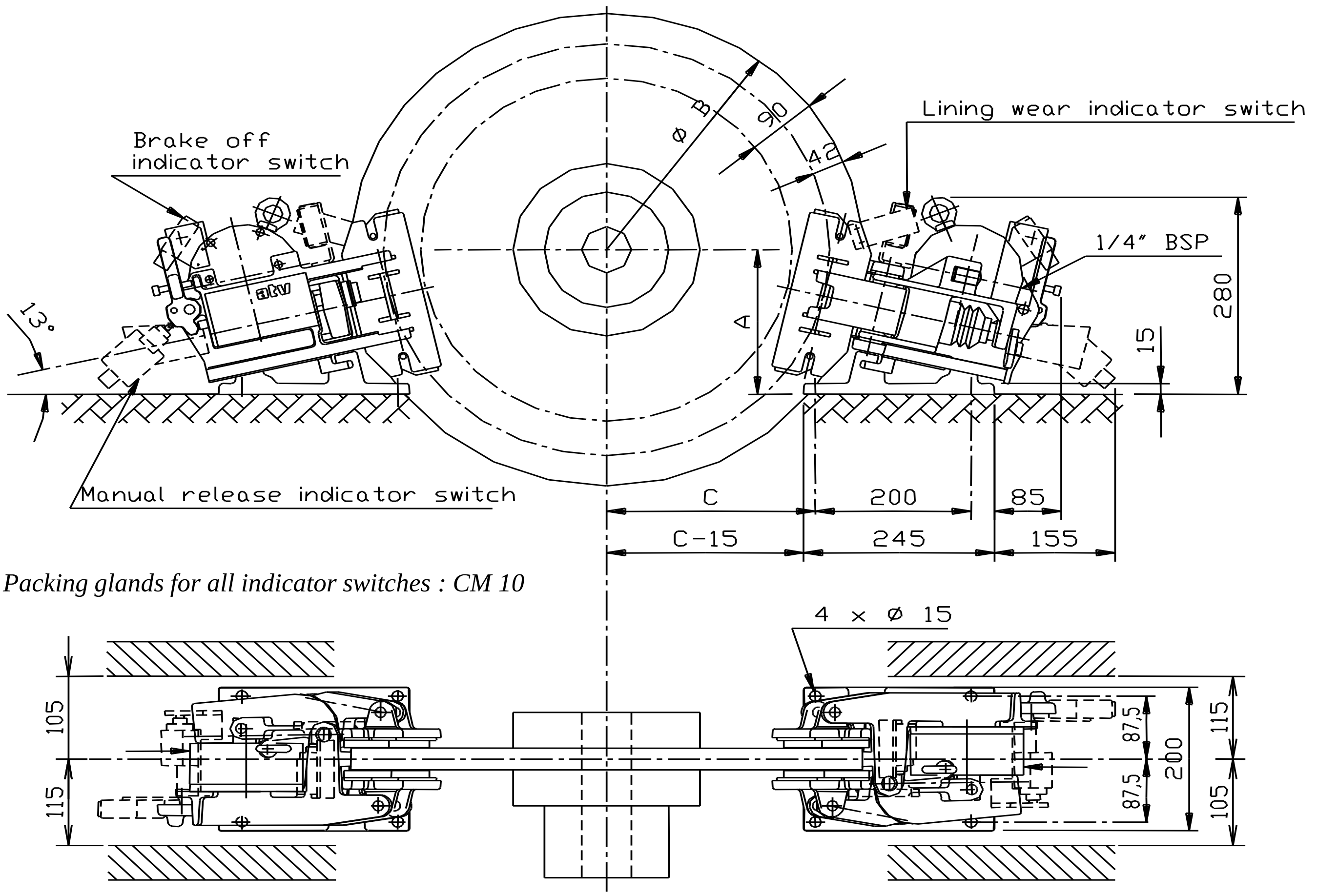
5 SE

FAIL SAFE DISC BRAKE

Spring braking - Electric release - Disc thickness : 12,7 to 30mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 5 SERM)
With automatic lining wear adjustment (REF : 5 SE)
The brake must work with an automatic power supplier (type ESE or ESP)

Brake disc diameter ØB	mm	315	355	395	445	495	550	625
Braking torque	N.m	190	220	260	300	340	390	460
Braking force	N	1650	Adjustable from 50% to 120%					
Max Reaction force	N	1 Caliper : 1980 N - 2 Calipers : 890 N						

CALIPER								
Power consumption	W	Release : 475 W - Hold : 14 W						
Response time	s	0,15						
Weight	kg	34						
A	mm	160	165	170	180	186	195	205
C	mm	100	120	140	160	190	220	255

For non standard discs : please contact ATV

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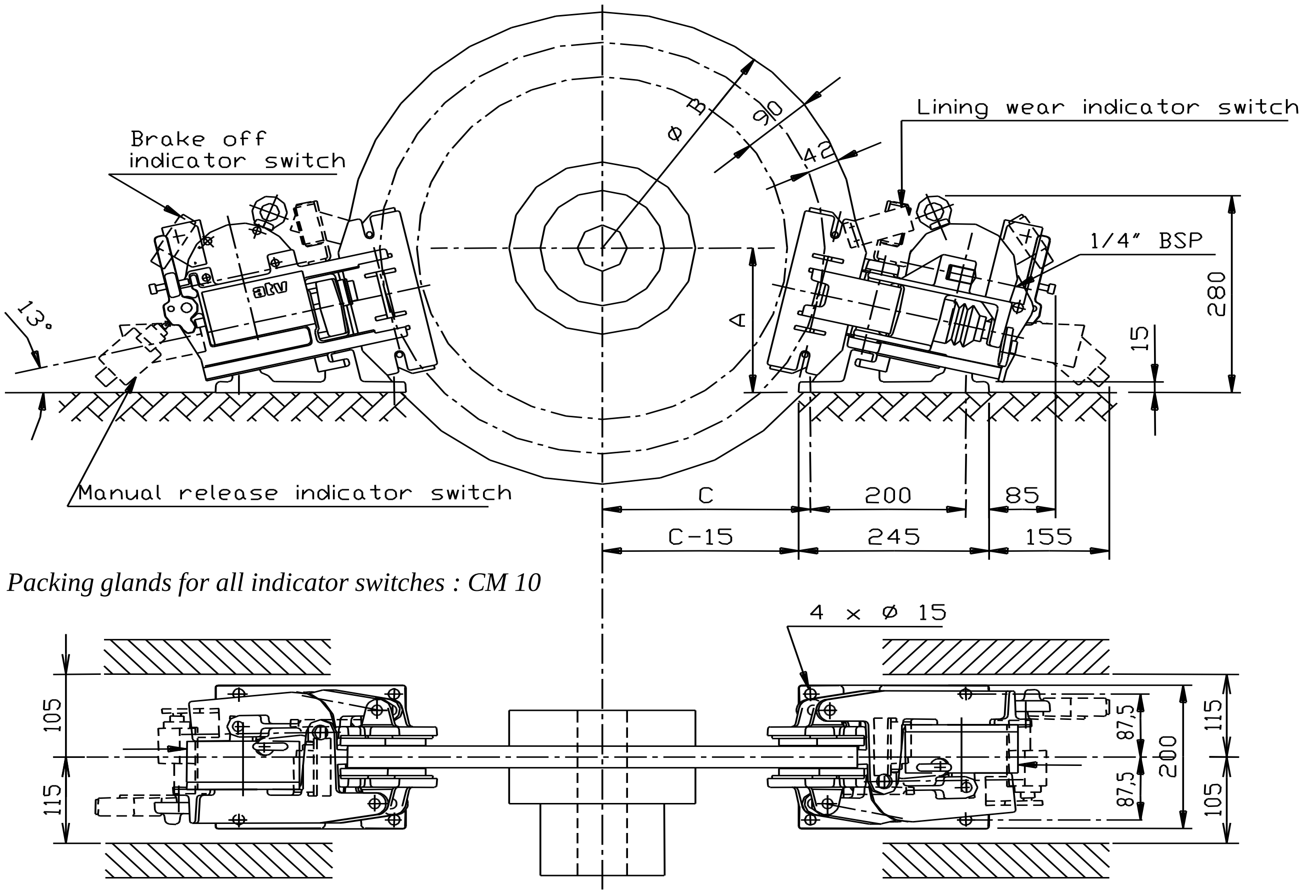
450 SE

FAIL SAFE BRAKE

Spring braking - Electric release - Disc thickness: 12,7 to 30 mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 450 SERM)
With automatic lining wear adjustment (REF : 450 SE)
The brake must work with an automatic power supplier (type ESE or ESP)

Brake disc diameter ØB	mm	315	355	395	445	495	550	625	705	795
Braking torque	N.m	380	450	510	600	680	770	900	1030	1180
Braking force	N	3340	Adjustable from 50% to 100%							
Max Reaction force	N	1 Caliper : 3340 N - 2 Calipers : 1500 N								

CALIPER										
Power consumption	W	Release : 1000 W - Hold : 44 W								
Response time	s	0,15								
Weight	kg	34								
A	mm	160	165	170	180	186	195	205	217	231
C	mm	100	120	140	160	190	220	255	296	341

For non standard discs : please contact ATV

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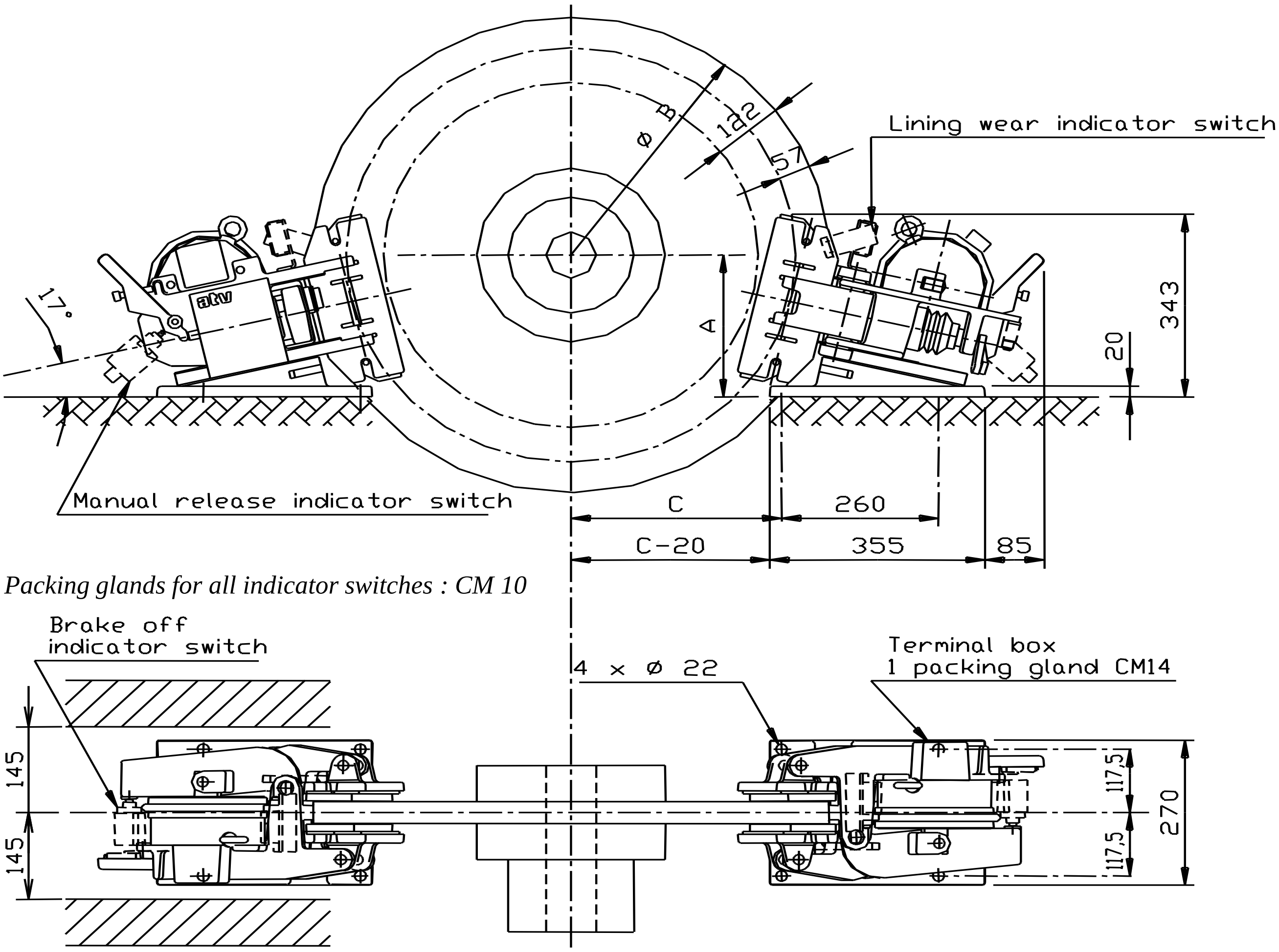
FAIL SAFE BRAKE

Spring braking - Electric release - Disc thickness: 12,7 to 30 mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 4 SERM)
With automatic lining wear adjustment (REF : 4 SE)
The brake must work with an automatic power supplier (type ESE or ESP)

Brake disc diameter ØB	mm	445	495	550	625	705	795
Braking torque	N.m	950	1120	1270	1500	1750	2000
Braking force	N	5880	Adjustable from 50% to 120%				
Max Reaction force	N	1 Caliper : 7060 N - 2 Calipers : 4130 N					

CALIPER							
Power consumption	W	Release : 1000 W - Hold : 42 W					
Response time	s	0,2					
Weight	kg	77					
A	mm	225	232	240	250	260	275
C	mm	130	154	180	215	255	295

For non standard discs : please contact ATV

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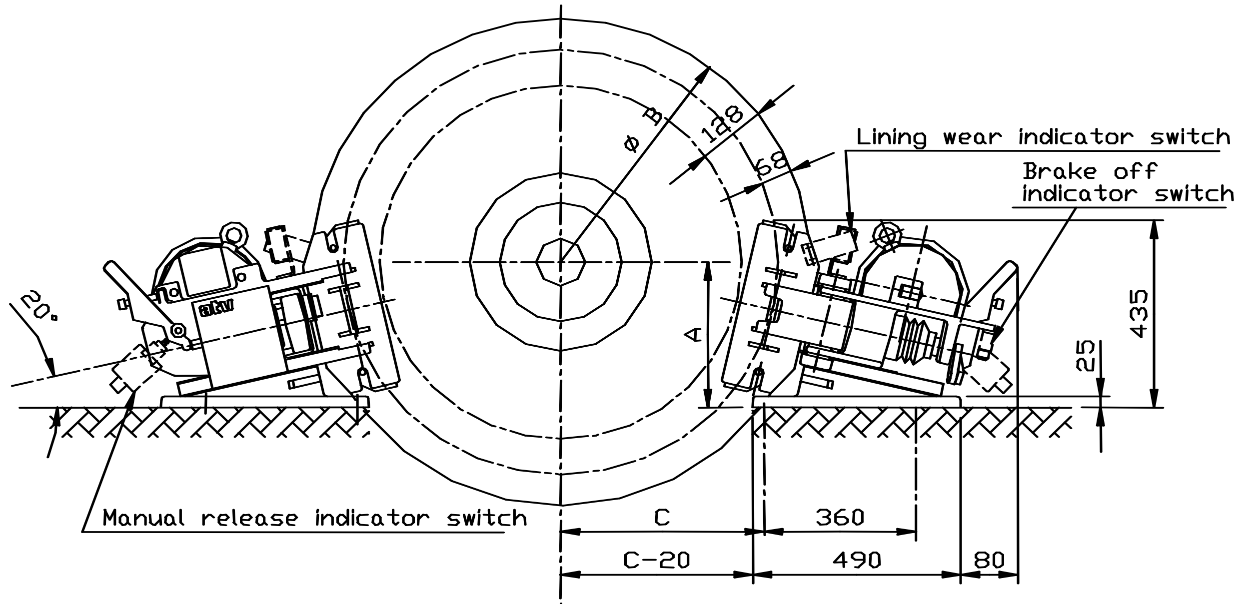
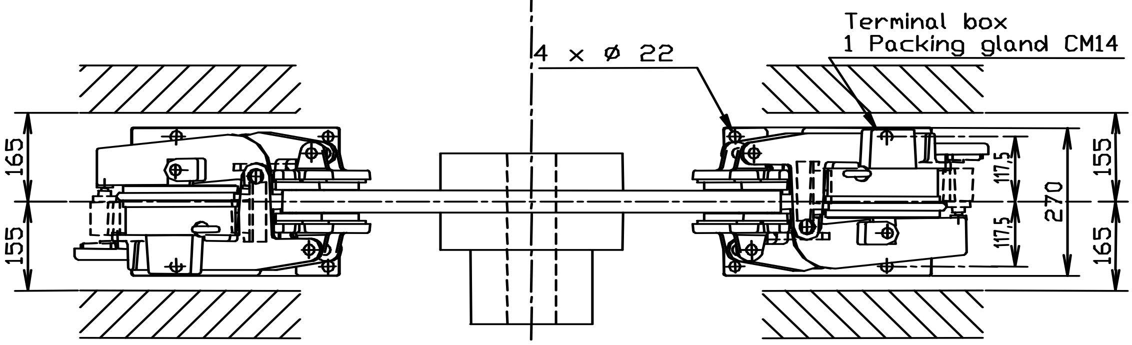
3 SE

FAIL SAFE BRAKE

Spring braking - Electric release - Disc thickness: 12,7 to 30 mm



Packing glands for all indicator switches : CM 10



Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 3 SERM)
With automatic lining wear adjustment (REF : 3 SE)
The brake must work with an automatic power supplier (type ESE or ESP)

Brake disc diameter ØB	mm	445	495	550	625	705	795
Braking torque	N.m	1600	1820	2100	2500	2900	3350
Braking force	N	10170	Adjustable from 50% to 120%				
Max Reaction force	N	1 Caliper : 12200 N - 2 Calipers : 8350 N					

CALIPER							
Power consumption	W	Release : 1095 W - Hold : 58 W					
Response time	s	0,2					
Weight	kg	120					
A	mm	285	294	305	315	330	345
C	mm	100	124	150	185	225	265

For non standard discs : please contact ATV

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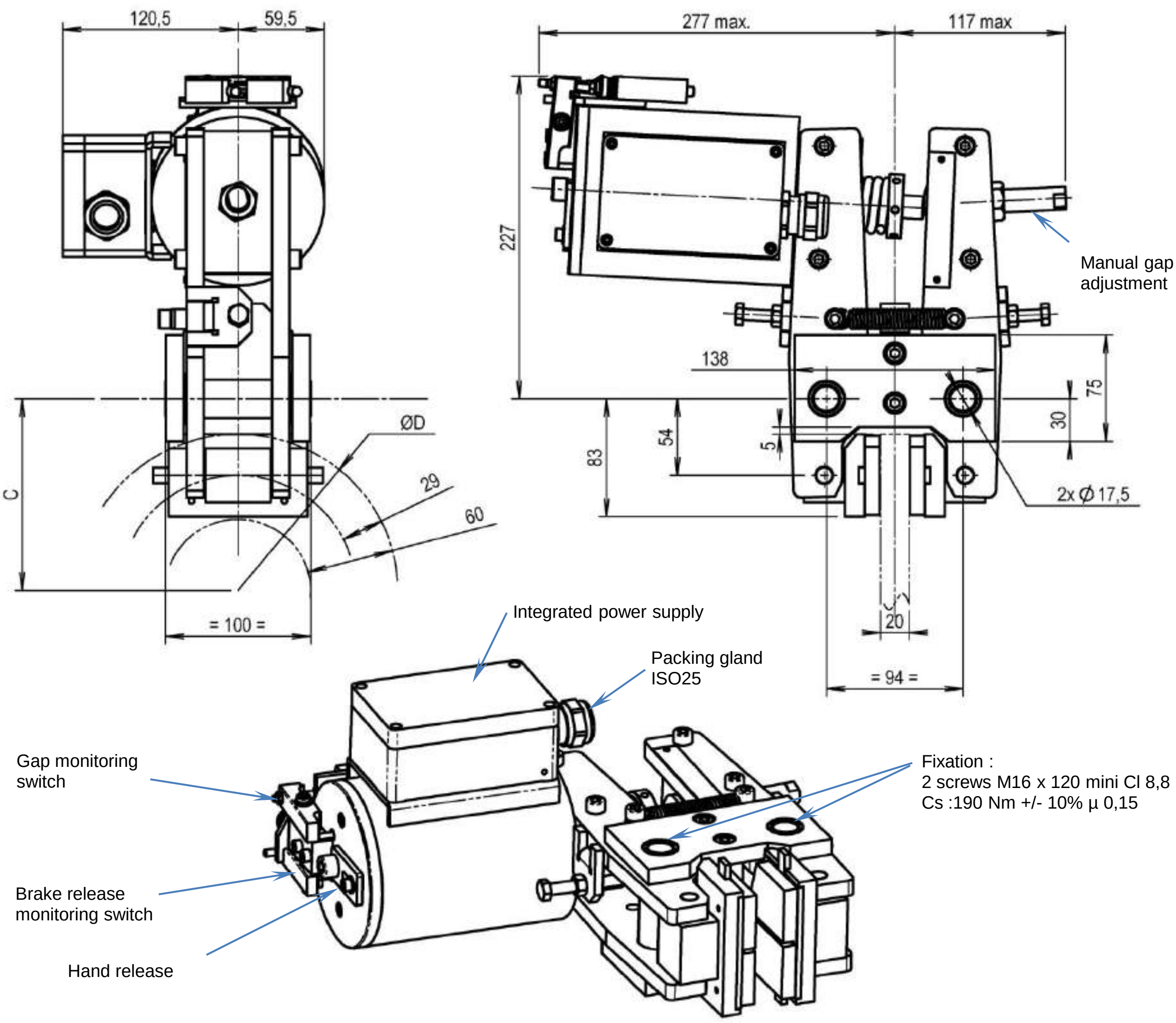
SAI3300

FAILSAFE DISC CALIPER

Spring applied - Electric release - Disc thickness 20mm



Data open to improvement

Handbook Nr 263
Drawing file Nr 12694

Technical features

Braking force :	*N*	3380
Total gap between pads and disc :	*mm*	1
Maximal wear per lining :	*mm*	8
Disc thickness :	*mm*	20
Weight :	*kg*	23

Braking torque : Cf [Nm] = 3,38 x Rf
With Braking radius Rf [mm] = (ØD/2) -29

Avec disque :	C [mm]	Cf [Nm]
Ø 220 mm	135	275
Ø 260 mm	155	340
Ø 315 mm	182,5	435
Ø 355 mm	202,5	500
Ø 395 mm	222,5	570
Ø 445 mm	247,5	655
Ø 495 mm	272,5	740
Ø 550 mm	300	830

Calcultation notes and 3D models available on request

Electrical data :

Feeding voltage :	400V AC, 3 Ph, 50Hz
Power (Release phase) :	450 W
Power (Hold phase) :	50 W
Electrical cabinet IP :	IP66

Working conditions :

Ambient temperature :	-20° / +60°C
Air humidity :	< 90 %

Monitoring switches :
240V 1,5A AC ; 250V 0,1A DC
Wire 5 x 0.75mm², Length 2m., Øext 7.5mm
Protection IP67

Options:
- Mounting kit (screws + washers)
- Execution for horizontal disc
- Sintered linings (for high temperature)
- Seawater execution

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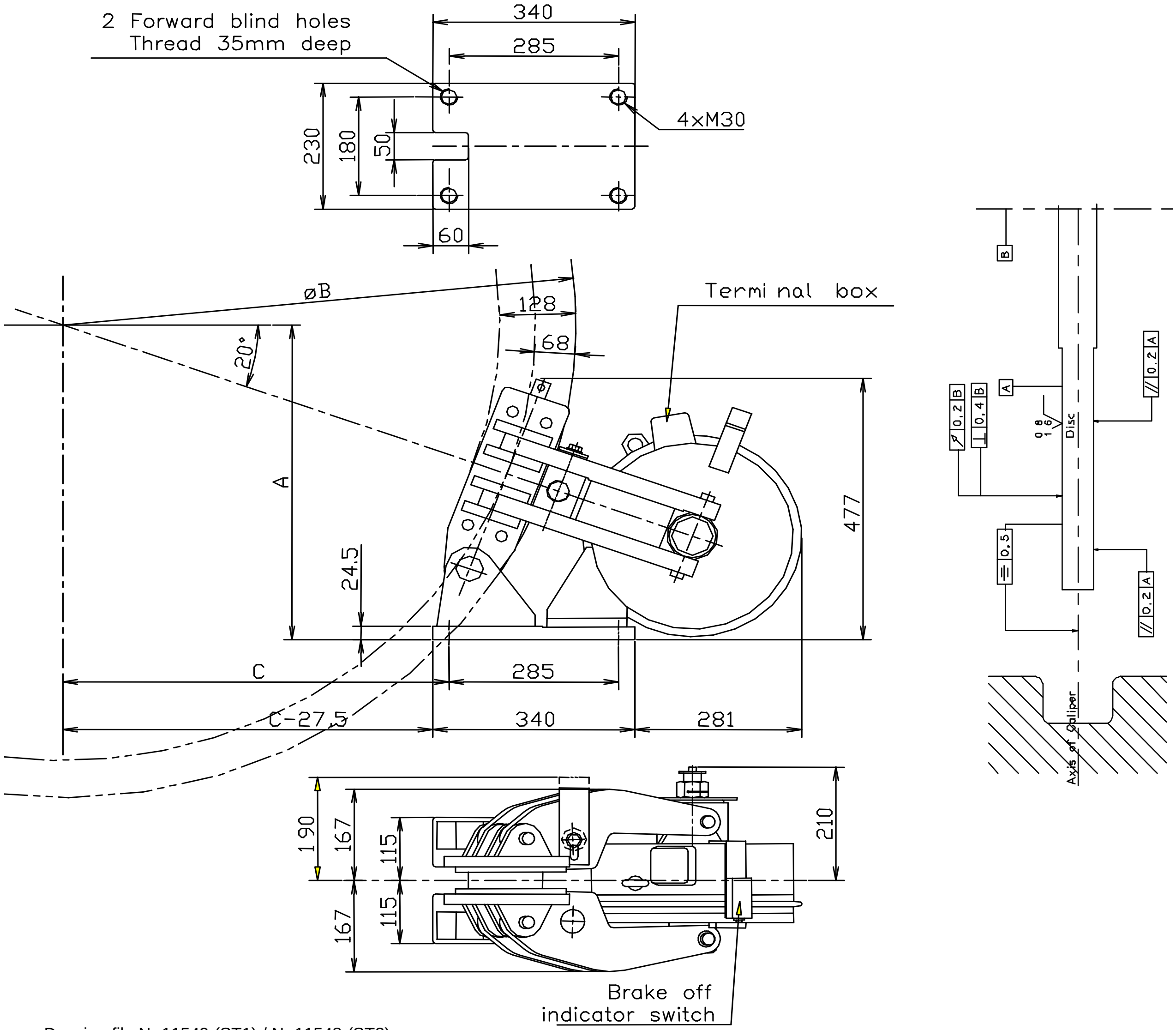
ST1 / ST2 SE

FAIL SAFE DISC BRAKE

Spring braking - Electric release - Disc thickness 30mm



Data open to improvment

Drawing file Nr 11549 (ST1) / Nr 11548 (ST2)

Handbook Nr 005 (ST1 /ST2 SERM = Manual wear adjustment)

Handbook Nr 250 (ST1 /ST2 SERA = Automatic wear adjustment)

Technical features:		ST1 SE	ST2 SE
Braking force :	kN	**35**	**70**
Total gap between pads and disc (nominal value):	mm	1	0,5
Response time:	s	0,2	
Power consumption (Release) :	W	2830	
Power consumption (Economy) :	W	160	
Weight :	kg	194	

The brake must be controlled by an automatic power supply type ESE or ESP (Data sheet F101 or F102)

Braking torque : Cf [Nm] = Braking force x Rf / 1000
Braking radius Rf [mm] = (ØD/2) -68

A [mm] = (0,171 x ØB) + 279
C [mm] = (0,470 x ØB) - 161

Fastening : 4 screws M30 Class 8.8 (not supplied)
Cs : 1200 Nm ±10% µ 0,15

Working conditions :

Ambient temperature:	-20° / +60°C
Humidity:	< 90 %

Monitoring switches :
240V 1,5A AC ; 250V 0,1A DC
PG11 cable gland
IP66 protection

Options :
- Automatic wear adjustment
- Opening switch
- Wear monitoring switch
- Seawater execution
- Off-shore certifications

Calculation notes or 3D models available on request

HYDRAULIC FAIL-SAFE CALIPERS

C2

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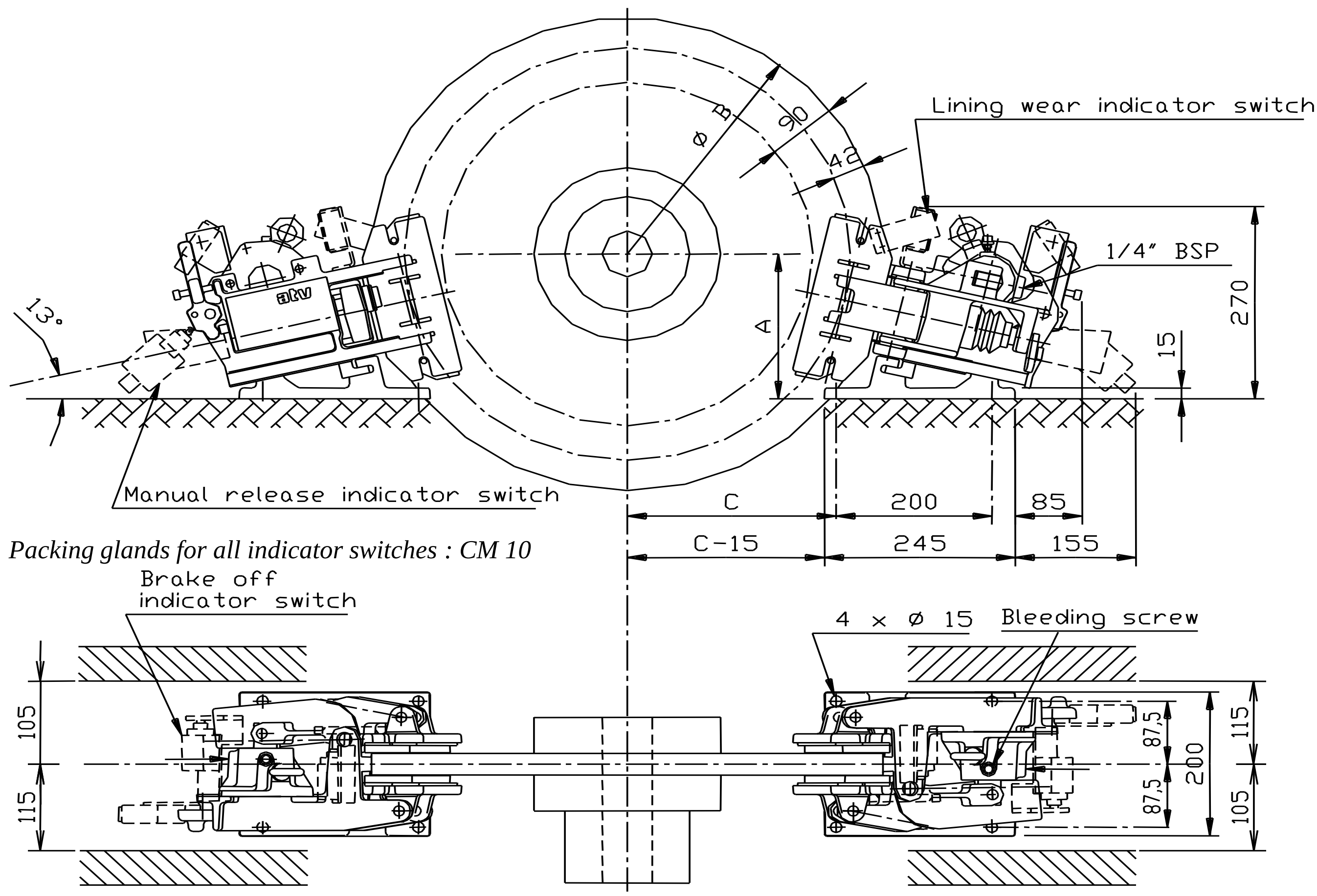
5 SH

FAIL SAFE DISC BRAKE

Spring braking - Hydraulic release - Disc thickness: 12,7 to 30mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 5 SHRM)

With automatic lining wear adjustment (REF : 5 SH)

The brake must work with a hydraulic power unit

Brake disc diameter ØB	mm	315	355	395	445	495	550	625
Braking torque	N.m	190	220	260	300	340	390	460
Braking force	N	1650	Adjustable from 50% to 120%					
Max Reaction force	N	1 Caliper : 1980 N - 2 Calipers : 890 N						

CALIPER	*For non standard discs : please contact ATV*							
A	mm	160	165	170	180	186	195	205
C	mm	100	120	140	160	190	220	255

Pressure	bar	100
Displaced volume for complete release	cm³	1,5
Total cylinder volume	cm³	13
Response time	s	0,15
Weight	kg	27

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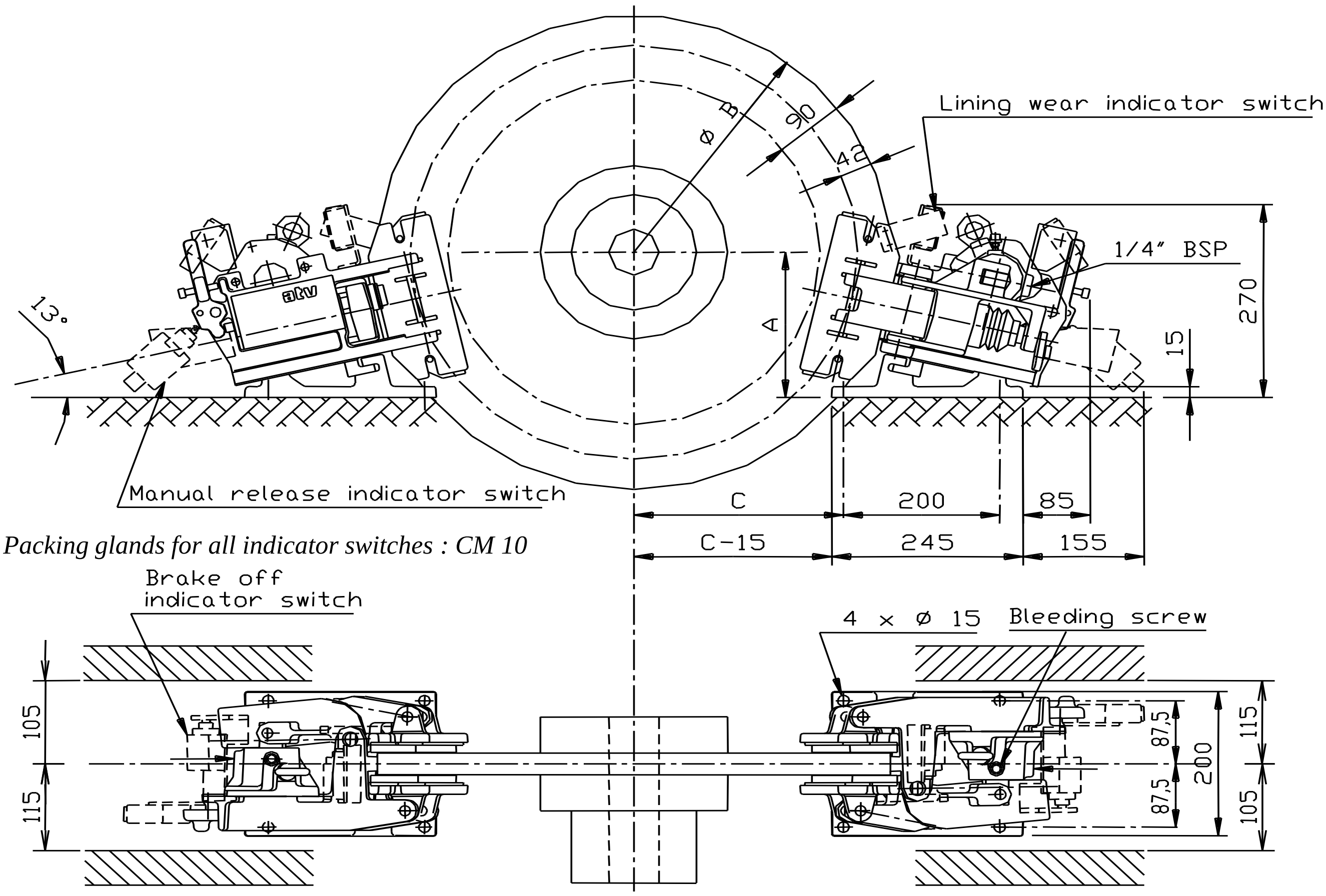
450 SH

FAIL SAFE DISC BRAKE

Spring braking - Hydraulic release - Disc thickness: 12,7 to 30mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 450 SHRM)

With automatic lining wear adjustment (REF : 450 SH)

The brake must work with a hydraulic power unit

Brake disc diameter ØB	mm	315	355	395	445	495	550	625	705	795
Braking torque	N.m	380	450	510	600	680	770	900	1030	1180
Braking force	N	3340	Adjustable from 50% à 100%							
Max Reaction force	N	1 Caliper : 3340 N - 2 Calipers : 1500 N								

CALIPER *For non standard discs : please contact ATV*

A	mm	160	165	170	180	186	195	205	217	231
C	mm	100	120	140	160	190	220	255	296	341

Pressure	bar	100
Displaced volume for complete release	cm³	3,1
Total cylinder volume	cm³	25
Response time	s	0,15
Weight	kg	27

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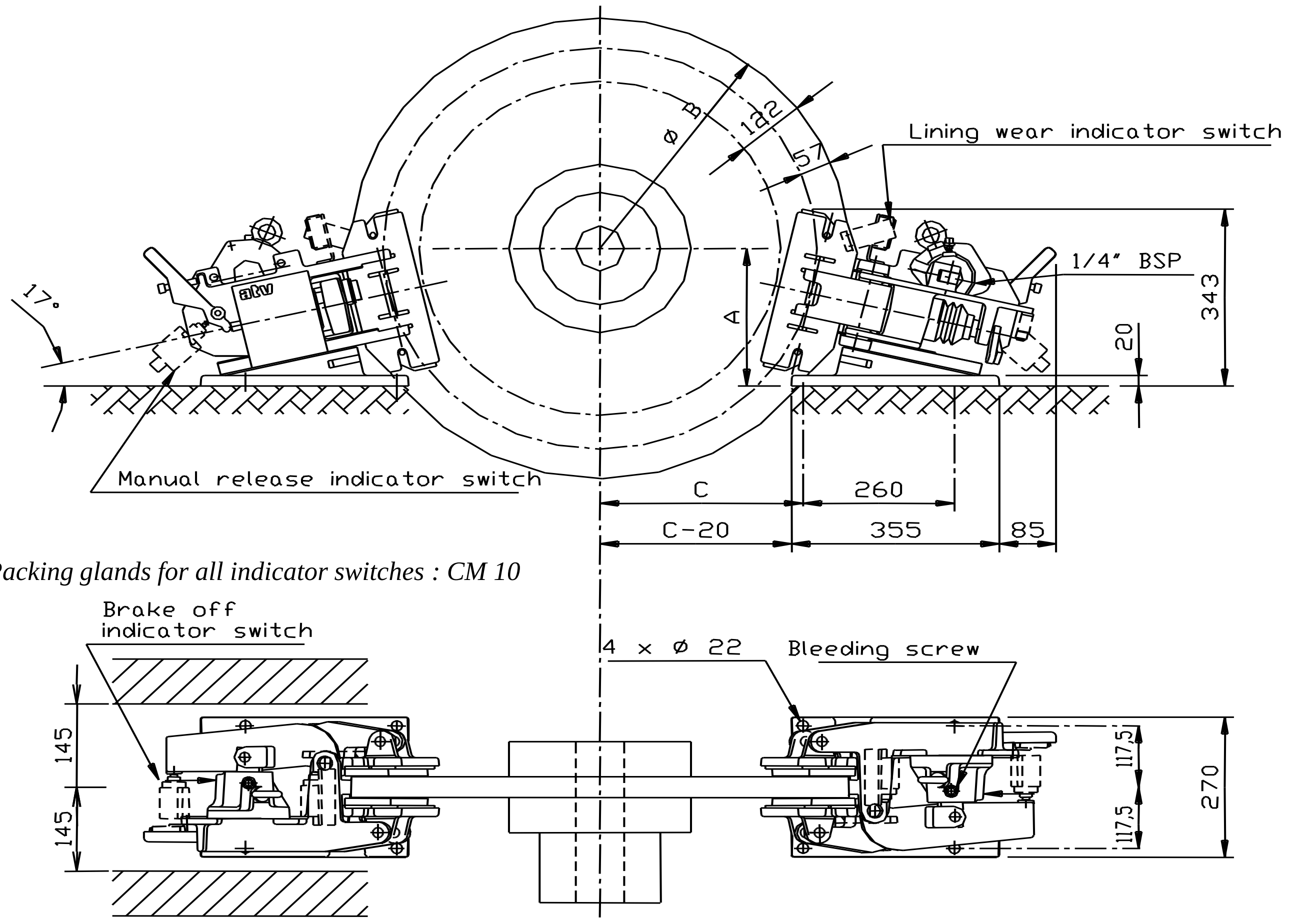
4 SH

FAIL SAFE DISC BRAKE

Spring braking - Hydraulic release - Disc thickness: 12,7 to 30mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 4 SHRM)

With automatic lining wear adjustment (REF : 4 SH)

The brake must work with a hydraulic power unit

Brake disc diameter ØB	mm	445	495	550	625	705	795
Braking torque	N.m	950	1120	1270	1500	1750	2000
Braking force	N	5880	Adjustable from 50% à 120%				
Max Reaction force	N	1 Caliper : 7060 N - 2 Calipers : 4130 N					

CALIPER	*For non standard discs : please contact ATV*						
A	mm	225	232	240	250	260	275
C	mm	130	154	180	215	255	295

Pressure	bar	100
Displaced volume for complete release	cm³	6,8
Total cylinder volume	cm³	77
Response time	s	0,2
Weight	kg	62

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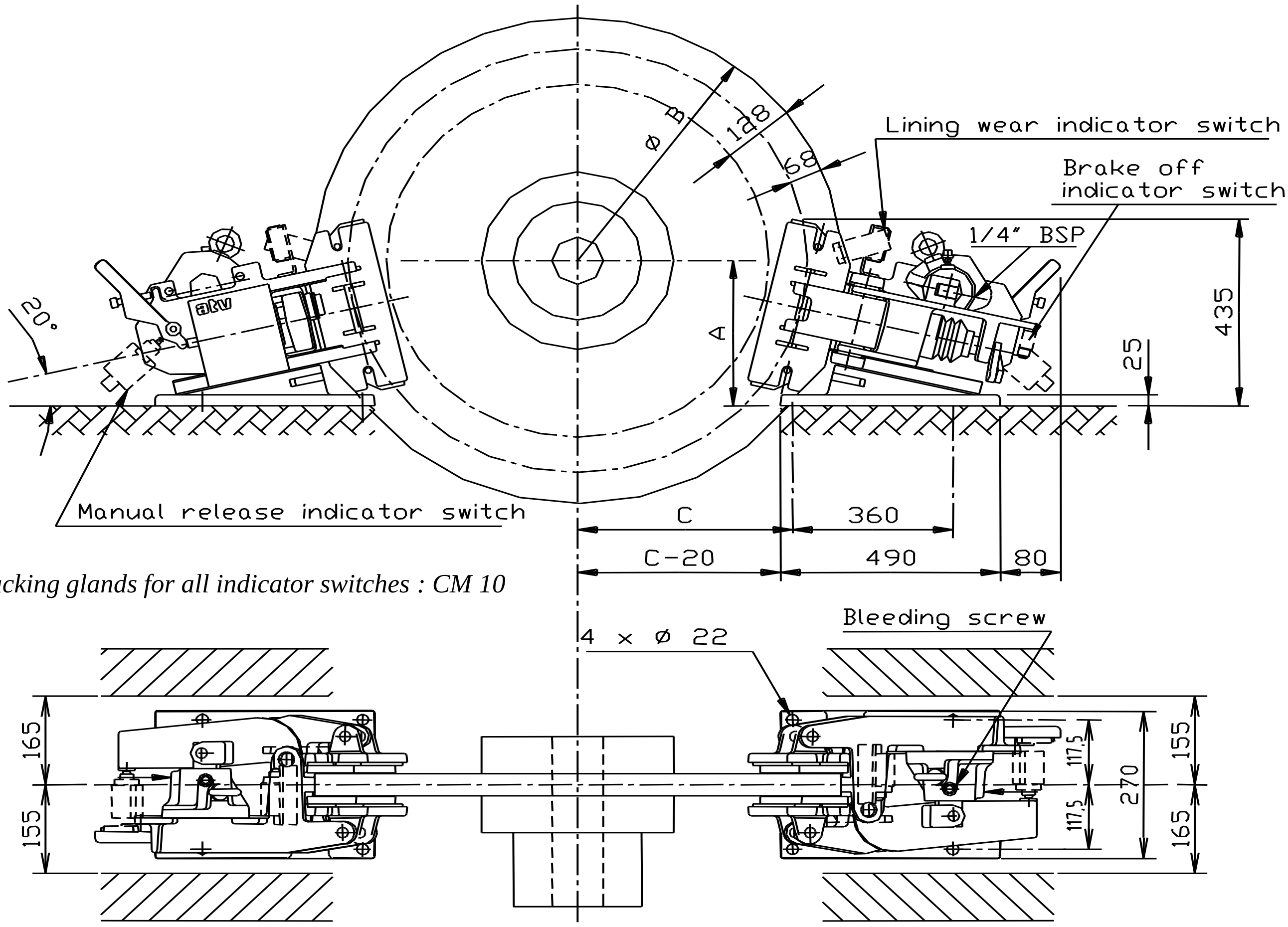
3 SH

FAIL SAFE DISC BRAKE

Spring braking - Hydraulic release - Disc thickness: 12,7 to 30mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 3 SHRM)

With automatic lining wear adjustment (REF : 3 SH)

The brake must work with a hydraulic power unit

Brake disc diameter ØB	mm	445	495	550	625	705	795
Braking torque	N.m	1600	1820	2100	2500	2900	3350
Braking force	N	10170	Adjustable from 50% à 120%				
Max Reaction force	N	1 Caliper : 12200 N - 2 Calipers : 8350 N					

CALIPER	*For non standard discs : please contact ATV*						
A	mm	285	294	305	315	330	345
C	mm	100	124	150	185	225	265

Pressure	bar	100
Displaced volume for complete release	cm³	8,5
Total cylinder volume	cm³	102
Response time	s	0,2
Weight	kg	95

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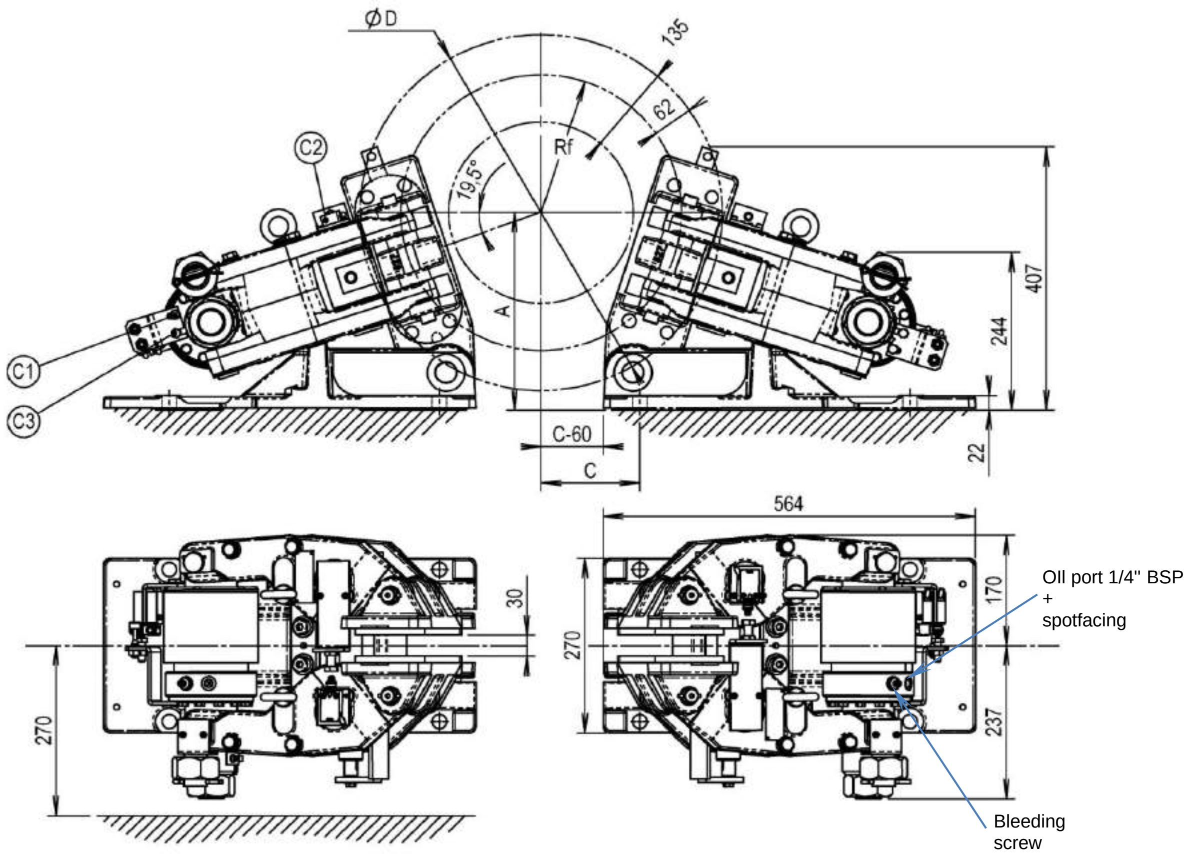
15SH - 30SH

FAIL SAFE DISC BRAKE

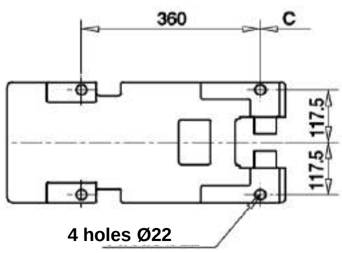
Spring braking - Hydraulic release



Right hand caliper

Left hand caliper

Data open to improvement



Caliper fixation 15 and 30

Instruction handbook nr 232 (RA)
Instruction handbook nr 233 (RM)
Power pack definition: see leaflet nr 262

Technical features:		**15SH**	**30SH**
Braking force [1]:	*N*	**20 000**	**40 000**
Total gap between pads and disc (nominal value):	*mm*	2	2
Release pressure:	*bar*	100	100
Response time:	*s*	0,2	0,2
Displaced volume for complete release:	*cm³*	17	42
Disc thickness:	*mm*	30	30
Weight:	*kg*	95	95

Braking torque : Cf [Nm] = Braking force x Rf / 1000
Braking radius Rf [mm] = (ØD/2) - 62

Disc ØD [mm] [2]		*495*	*550*	*625*	*705*	*795*
Cf [Nm] [1]	**15SH**	3 650	4 200	4 950	5 750	6 650
	30SH	7 300	8 400	9 900	11 500	13 300
Dimension A [mm]		295	305	315	330	345
Dimension C [mm]		120	150	185	225	265

[1] adjustable from 60% to 100%
*[2] For different Ø => **A= ØB x 0,167 + 210** et **C= ØB x 0,473 - 109***

Fixation: 4 screw M20 Class 8.8 and 4 washers Z20 (not supplied)
Cs : 340 Nm ±10% µ 0,15

Working conditions :
Ambient temperature: -10°C +40°C
Humidity: <70%
Dusty ambience: ≥ 65µ
Horizontal position(others conditions, contact ATV)

Monitoring switches :
240V 1,5A AC ; 250V 0,1A DC
Wire 5 x 0.75mm², length 2m., Øext 7.5mm
IP67 protection

Options :
- Opening switch C1
- Adjustment switch C3
- Wear switch C2
- 42mm Disc thickness
- Automatic wear adjustment (RA)
- Seawater execution

Calculation notes or 3D models available on request

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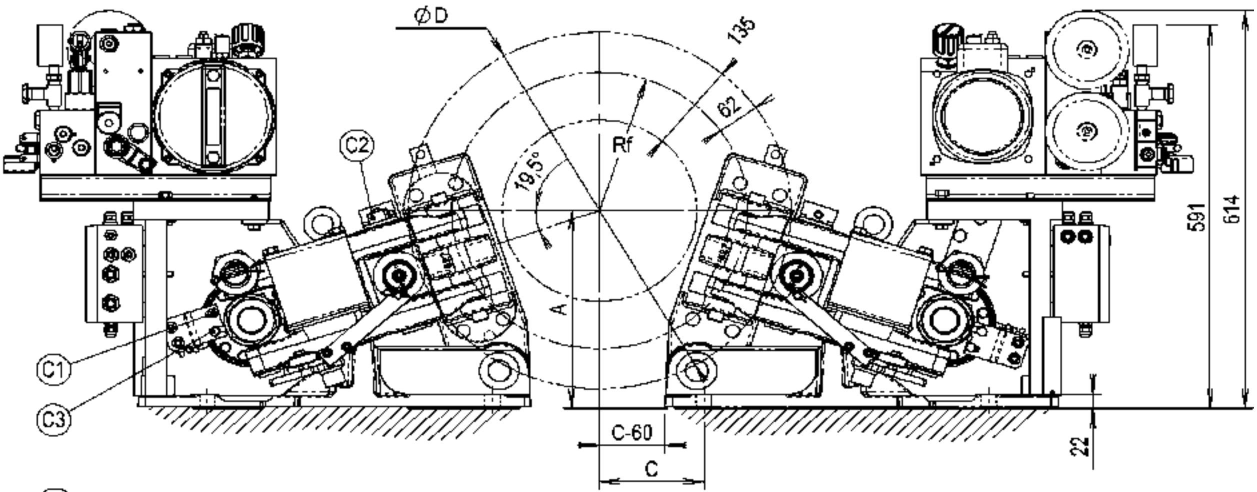
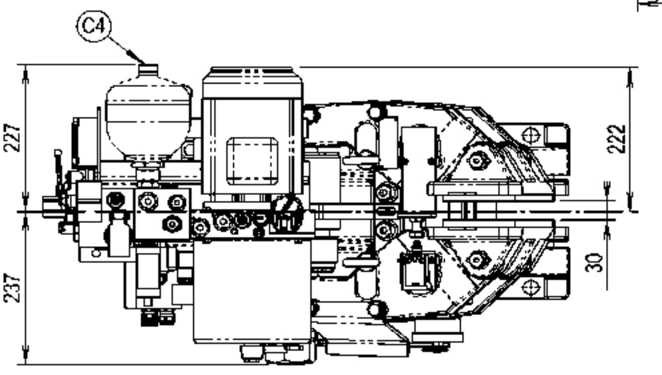
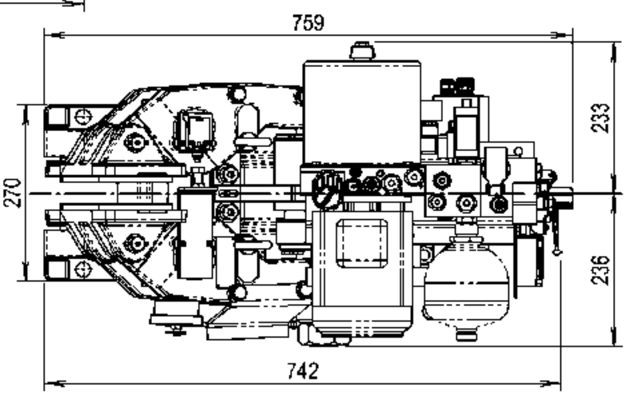
15SHCI - 30SHCI

FAIL SAFE DISC BRAKE

Spring braking - Electro-hydraulic release



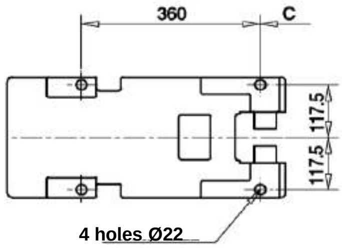




Data open to improvement

Right hand caliper

Left hand caliper



Caliper fixation 15 and 30

Instruction handbook nr 232 (RA)
Instruction handbook nr 233 (RM)
Power pack definition: see leaflet nr 262

Technical features:		**15SHCI**	**30SHCI**
Braking force ¹:	*N*	**20 000**	**40 000**
Total gap between pads and disc (nominal value):	*mm*	2	2
Power consumption	*kW*	0,65	0,65
Response time:	*s*	0,2	0,2
Supply voltage (Tripahsé 50Hz)	*V AC*	400	0,65
Disc thickness:	*mm*	30	30
Weight:	*kg*	125	125

Working conditions :
Ambient temperature: -10°C +40°C
Humidity: <70%
Dusty ambience: ≥ 65µ
Horizontal position(others conditions, contact ATV)

Monitoring switches :
240V 1,5A AC ; 250V 0,1A DC
Wire 5 x 0.75mm², length 2m., Øext 7.5mm
IP67 protection

Braking torque : Cf [Nm] = Braking force x Rf / 1000
Braking radius Rf [mm] = (ØD/2) - 62

Disc ØD [mm] ²		*495*	*550*	*625*	*705*	*795*
Cf [Nm] ¹	**15SHCI**	3 650	4 200	4 950	5 750	6 650
	30SHCI	7 300	8 400	9 900	11 500	13 300
Dimension A [mm]		295	305	315	330	345
Dimension C [mm]		120	150	185	225	265

¹ adjustable from 60% to 100%
*² For different Ø => **A= ØB x 0,167 + 210** et **C= ØB x 0,473 - 109***

Fixation: 4 screw M20 Class 8.8 and 4 washers Z20 (not supplied)
Cs : 340 Nm ±10% µ 0,15

Options :
- Opening switch C1
- Adjustment switch C3
- Wear switch C2
- Accumulators C4
- 42mm Disc thickness
- Automatic wear adjustment (RA)

Calculation notes or 3D models available on request

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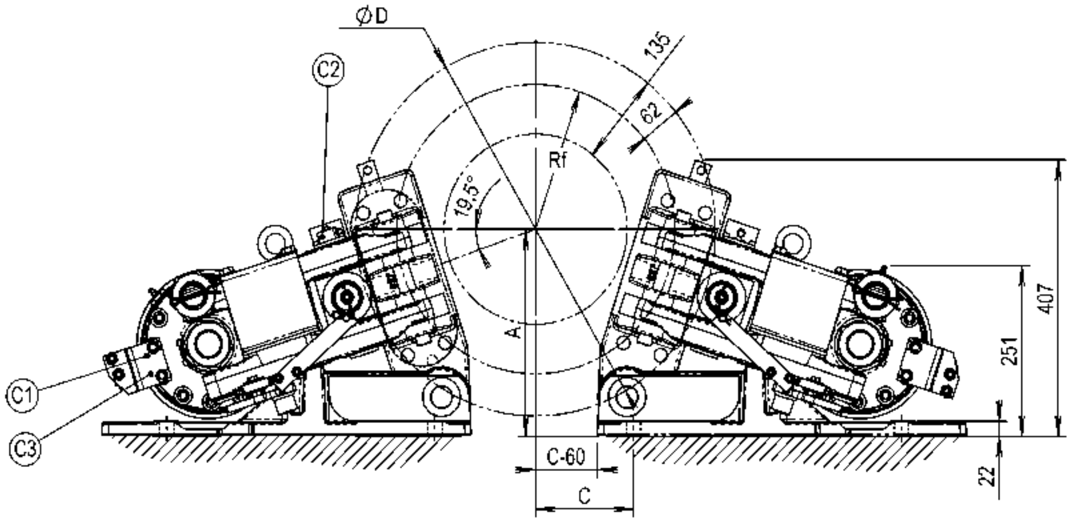
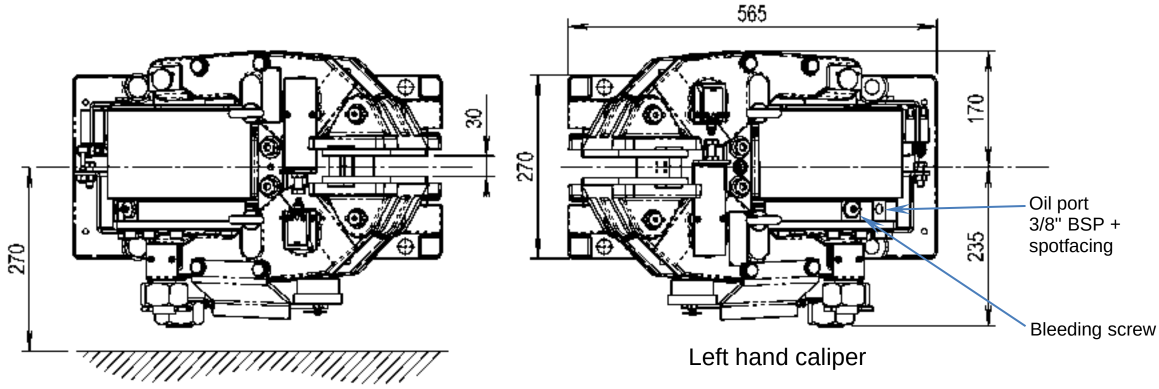
60SH - 105SH

FAIL SAFE DISC BRAKE

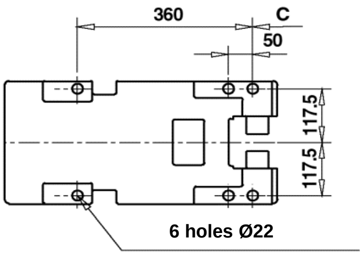
Spring braking - Hydraulic release

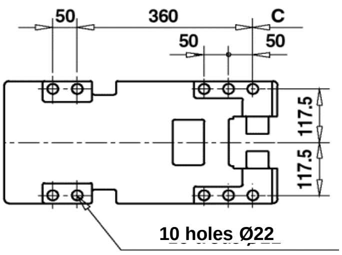




Left hand caliper

Right hand caliper





Instruction handbook nr 232 (RA)
Instruction handbook nr 233 (R
Power pack definition: see leaflet nr 262M)

Caliper fixation 60 **Caliper fixation 105**

Data open to improvement

Technical features:

		60SH	105SH
Braking force ¹:	*N*	**84 000**	**147 000**
Total gap between pads and disc (nominal value):	*mm*	2	2
Release pressure:	*bar*	100	100
Response time:	*s*	0,2	0,2
Displaced volume for complete release:	*cm³*	80	166
Disc thickness:	*mm*	30	30
Weight:	*kg*	105	105

Braking torque : Cf [Nm] = Braking force x Rf / 1000
Braking radius Rf [mm] = (ØD/2) - 62

Disc ØD [mm] ²		*495*	*550*	*625*	*705*	*795*
Cf [Nm] ¹	**60SH**	15 500	17 900	21 000	24 400	28 100
	105SH	27 200	31 300	36 700	42 600	49 200
Dimension A [mm]		295	305	315	330	345
Dimension C [mm]		120	150	185	225	265

¹ adjustable from 60% to 100%
*² For different Ø => **A= ØB x 0,167 + 210** et **C= ØB x 0,473 - 109***

Fixation: 6 or 10 screw M20 Class 8.8 and washers Z20 (not supplied)
Cs : 340 Nm ±10% µ 0,15

Working conditions :
Ambient temperature: -10°C +40°C
Humidity: <70%
Dusty ambience: ≥ 65µ
Horizontal position(others conditions, contact ATV)

Monitoring switches :
240V 1,5A AC ; 250V 0,1A DC
Wire 5 x 0.75mm², length 2m., Øext 7.5mm
IP67 protection

Options :
- Opening switch C1
- Adjustment switch C3
- Wear switch C2
- 42mm Disc thickness
- Automatic wear adjustment (RA)
- Seawater execution

Calculation notes or 3D models available on request

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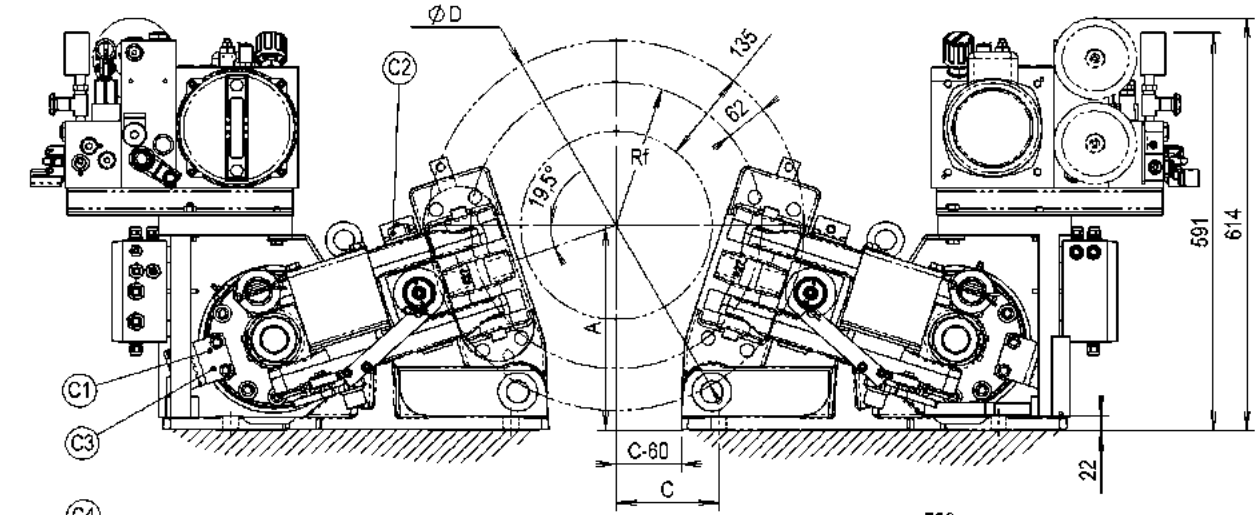
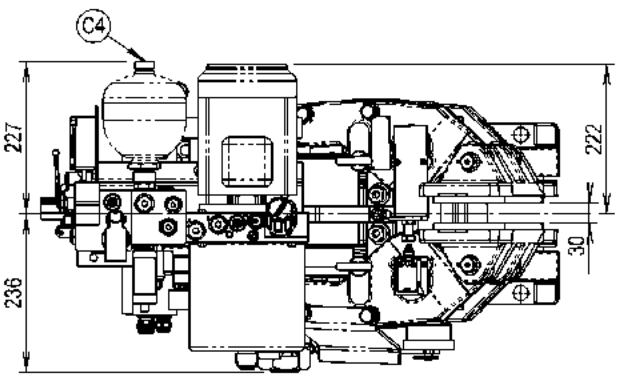
60SHCI - 105SHCI

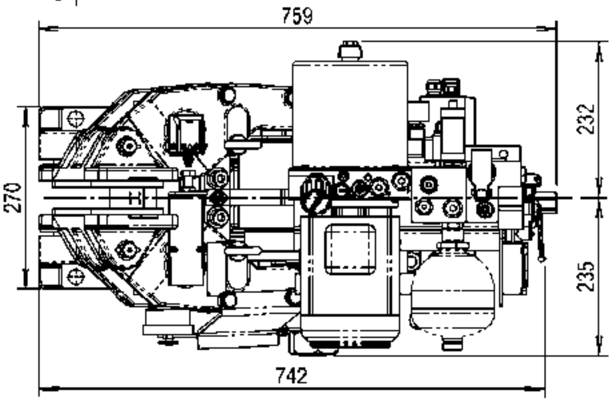
FAIL SAFE DISC BRAKE

Spring braking - Electro-hydraulic release



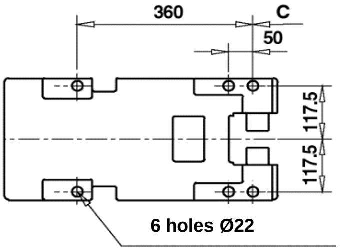
Data open to improvement



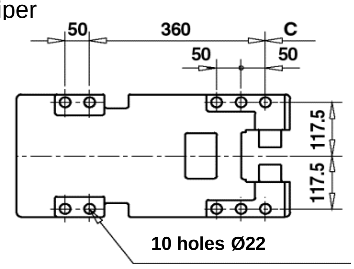


Right hand caliper

Left hand caliper



Caliper fixation 60



Caliper fixation 105

Instruction handbook nr 232 (RA)
Instruction handbook nr 233 (RM)
Power pack definition: see leaflet nr 262

Technical features:		60SHCI	105SHCI
Braking force [1]:	*N*	**84 000**	**147 000**
Total gap between pads and disc (nominal value):	*mm*	2	2
Power consumption	*kW*	0,65	0,65
Response time:	*s*	0,2	0,2
Supply voltage (Tripahsé 50Hz)	*V AC*	400	400
Disc thickness:	*mm*	30	30
Weight:	*kg*	135	135

Braking torque : Cf [Nm] = Braking force x Rf / 1000
Braking radius Rf [mm] = (ØD/2) - 62

Disc ØD [mm] [2]		*495*	*550*	*625*	*705*	*795*
Cf [Nm] [1]	**60SHCI**	15 500	17 900	21 000	24 400	28 100
	105SHCI	27 200	31 300	36 700	42 600	49 200
Dimension A [mm]		295	305	315	330	345
Dimension C [mm]		120	150	185	225	265

[1] adjustable from 60% to 100%
*[2] For different Ø => **A= ØB x 0,167 + 210** et **C= ØB x 0,473 - 109***

Fixation: 6 or 10 screw M20 Class 8.8 and washers Z20 (not supplied)
Cs : 340 Nm ±10% µ 0,15

Working conditions :
Ambient temperature: -10°C +40°C
Humidity: <70%
Dusty ambience: ≥ 65µ
Horizontal position(others conditions, contact ATV)

Monitoring switches :
240V 1,5A AC ; 250V 0,1A DC
Wire 5 x 0.75mm², length 2m., Øext 7.5mm
IP67 protection

Options :
- Opening switch C1
- Adjustment switch C3
- Wear switch C2
- Accumulators C4
- 42mm Disc thickness
- Automatic wear adjustment (RA)

Calculation notes or 3D models available on request

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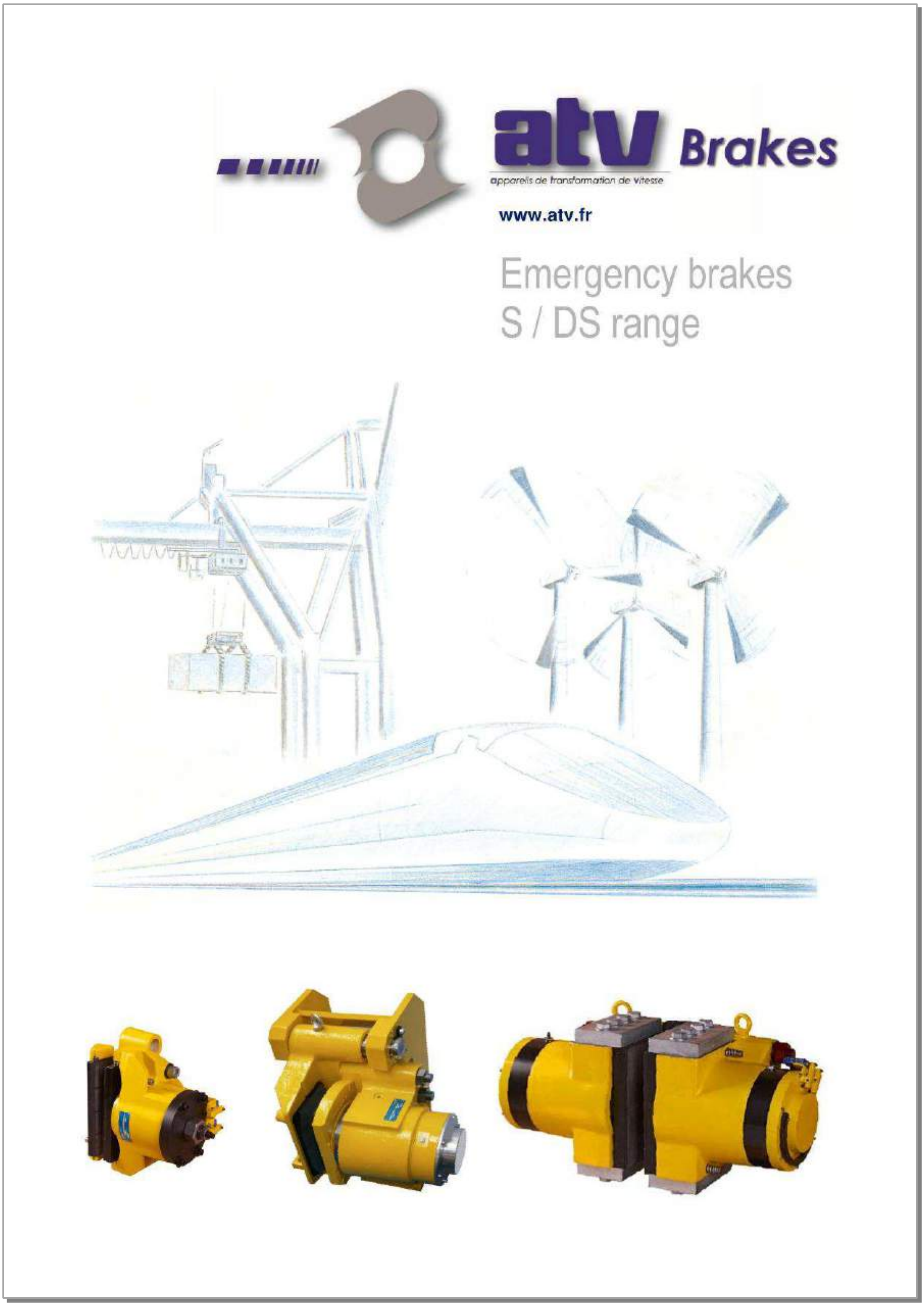
CATALOGUE AVAILABLE ON REQUEST



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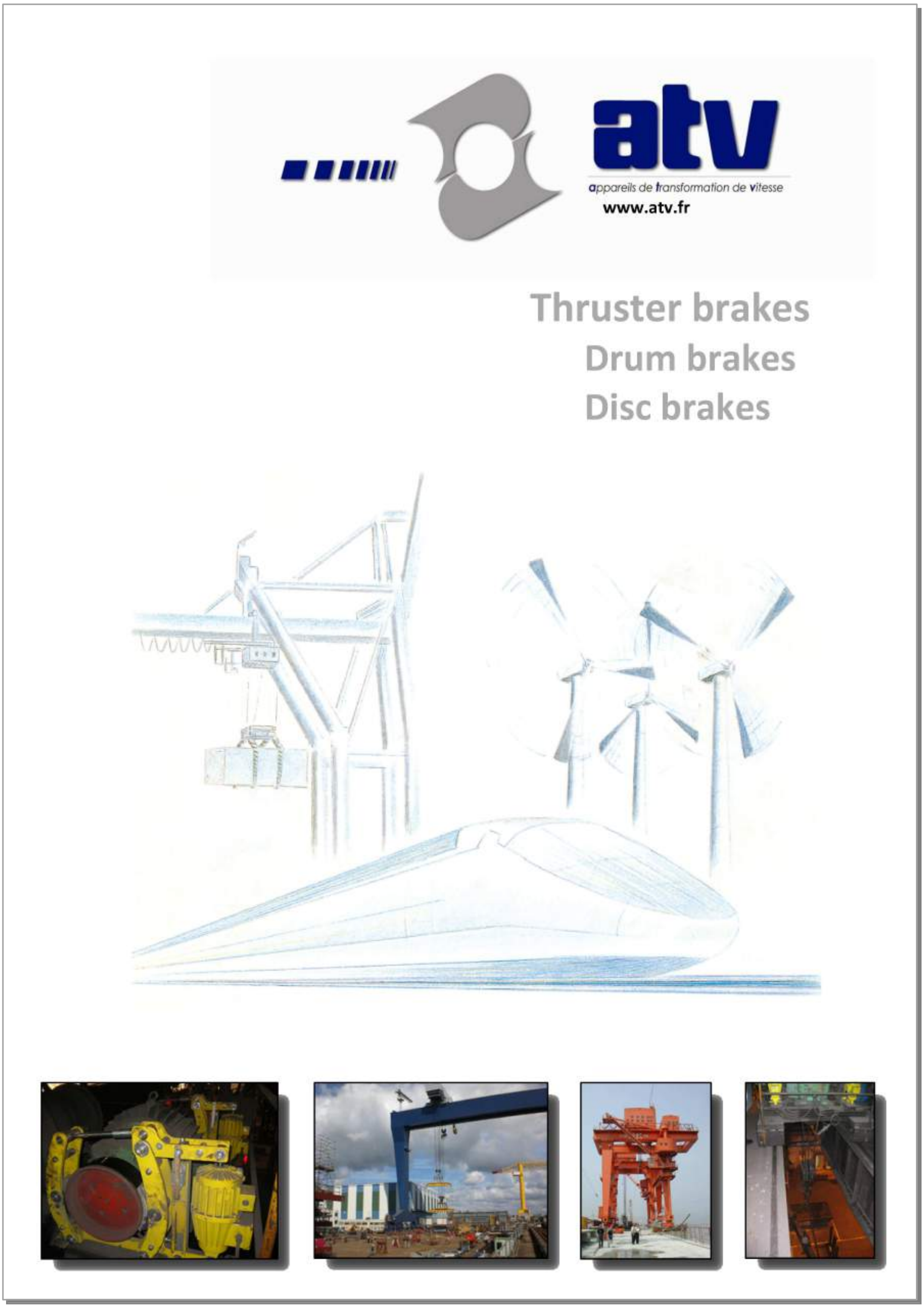
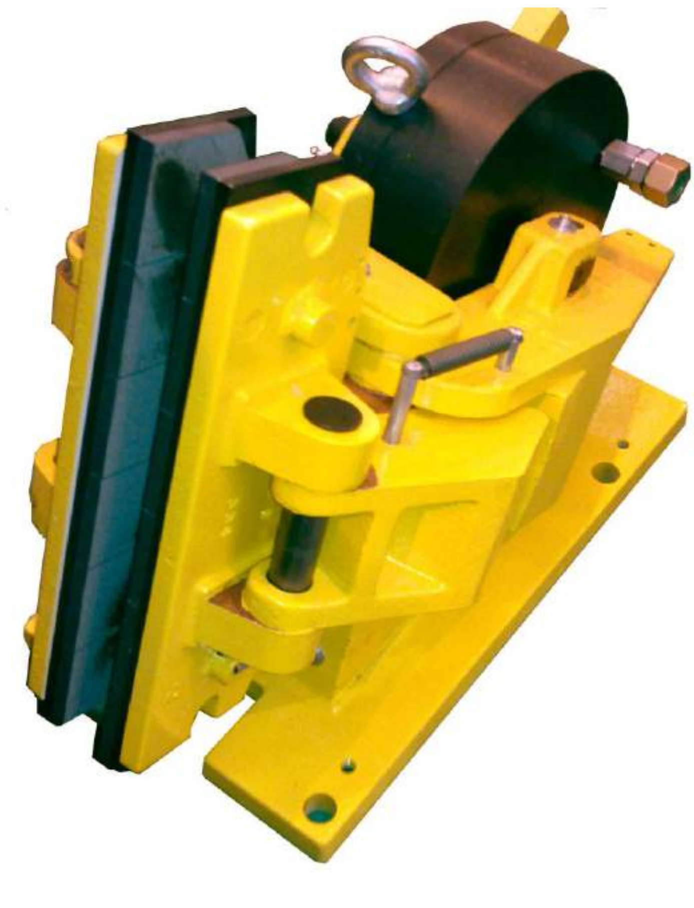


PNEUMATIC FAIL-SAFE CALIPERS



C3

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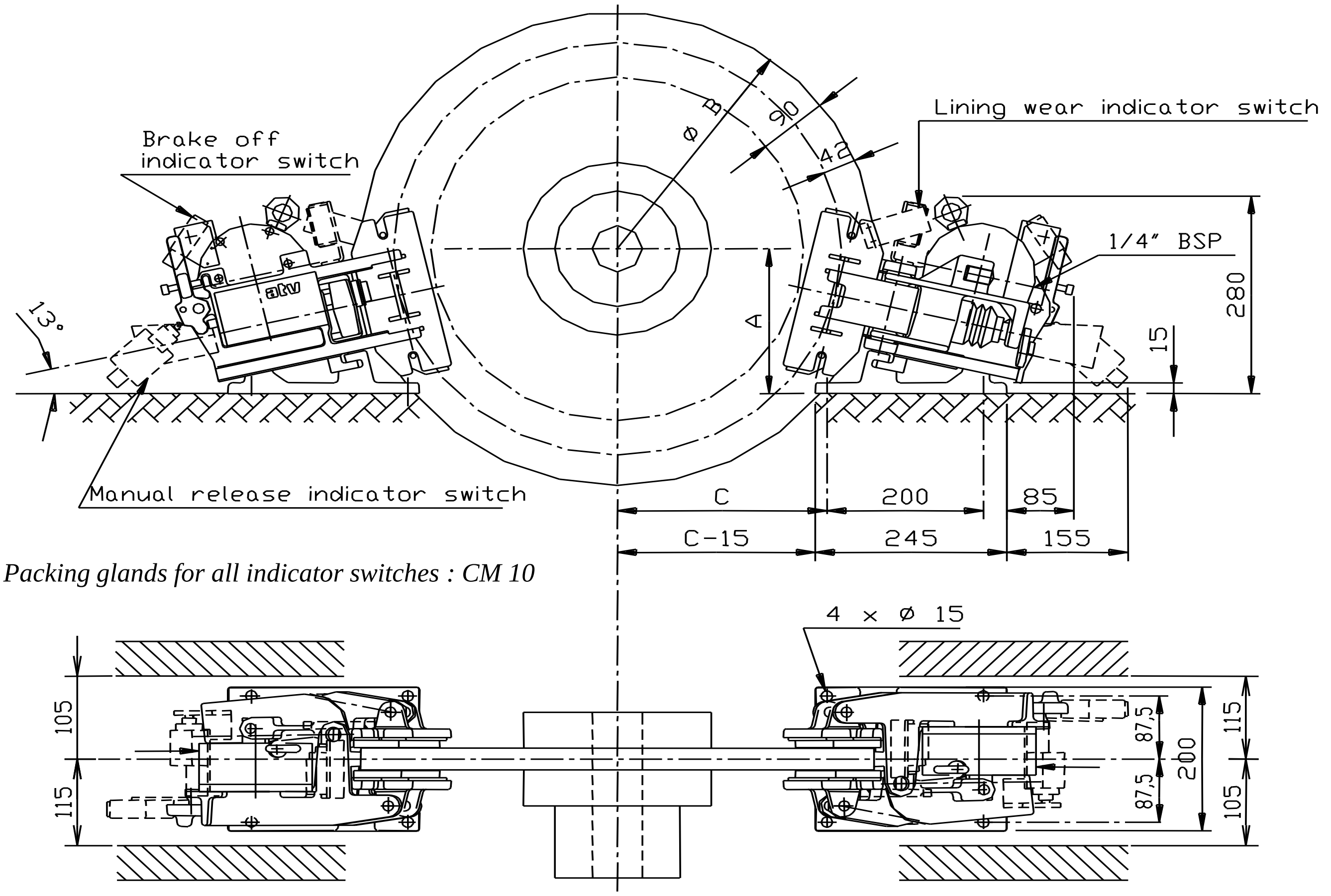
F 78230 Le Pecq
Tel : (33) - 1 - 30.15.41.00.
Fax : (33) - 1 - 30.15.41.19.

5 SP

FAIL SAFE DISC BRAKE

Spring braking - Pneumatic release - Disc thickness: 12,7 to 30mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

without automatic lining wear adjustment (REF : 5 SPRM)

with automatic lining wear adjustment (REF : 5 SP)

Brake disc diameter ØB	mm	315	355	395	445	495	550	625
Braking torque	N.m	190	220	260	300	340	390	460
Braking force	N	1650	Adjustable from 50% à 120%					
Max Reaction force	N	1 Caliper : 1980 N - 2 Calipers : 890 N						

CALIPER	*For non standard discs : please contact ATV*							
A	mm	160	165	170	180	186	195	205
C	mm	100	120	140	160	190	220	255
Release pressure	bar	5						
Response time	s	0,15						
Weight	kg	34						

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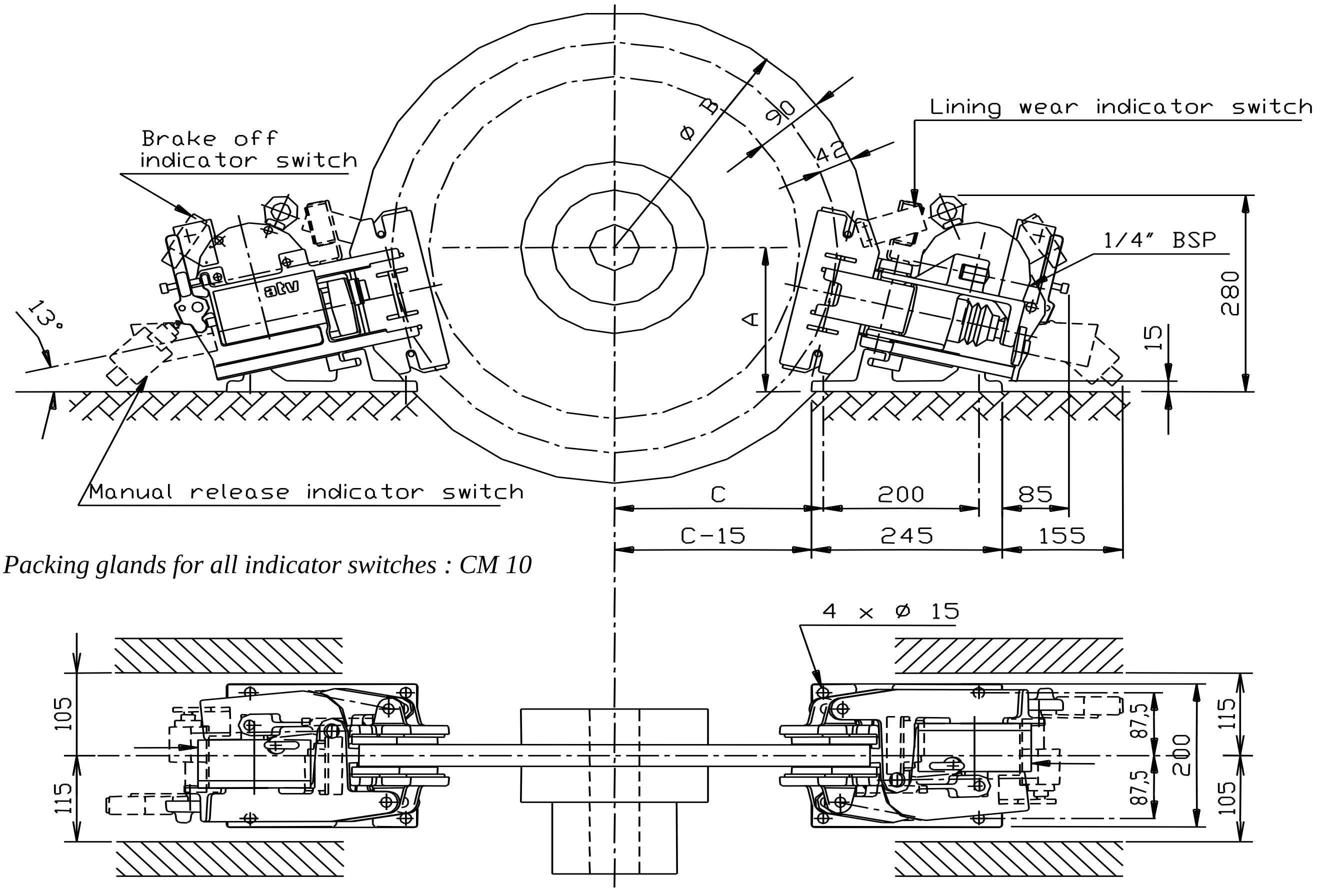
450 SP

FAIL SAFE BRAKE

Spring braking - Pneumatic release - Disc thickness: 12,7 to 30mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 450 SPRM)

With automatic lining wear adjustment (REF : 450 SP)

Brake disc diameter ØB	mm	315	355	395	445	495	550	625	705	795
Braking torque	N.m	380	450	510	600	680	770	900	1030	1180
Braking force	N	3340	Adjustable from 50% to 100%							
Max Reaction force	N	1 Caliper : 3340 N - 2 Calipers : 1500 N								

CALIPER *For non standard discs : please contact ATV*

A	mm	160	165	170	180	186	195	205	217	231
C	mm	100	120	140	160	190	220	255	296	341

Release pressure	bar	6
Response time	s	0,15
Weight	kg	34

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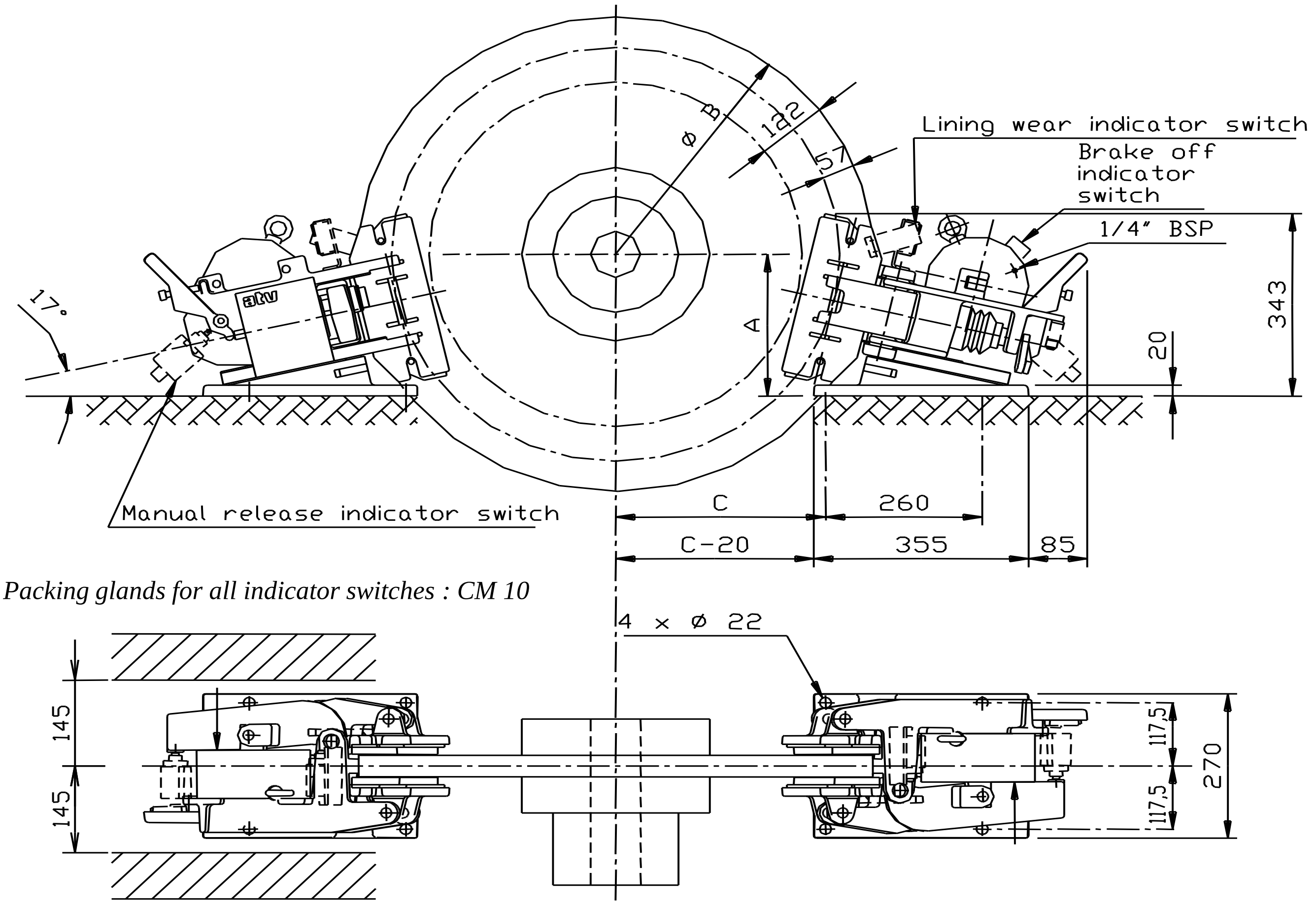
4 SP

FAIL SAFE DISC BRAKE

Spring braking - Pneumatic release - Disc thickness: 12,7 to 30mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 4 SPRM)

With automatic lining wear adjustment (REF : 4 SP)

Brake disc diameter ØB	mm	445	495	550	625	705	795
Braking torque	N.m	950	1120	1270	1500	1750	2000
Braking force	N	5880	Adjustable from 50% à 120%				
Max Reaction force	N	1 Caliper : 7060 N - 2 Calipers : 4130 N					

CALIPER *For non standard discs : please contact ATV*

A	mm	225	232	240	250	260	275
C	mm	130	154	180	215	255	295

Release pressure	bar	5
Response time	s	0,2
Weight	kg	77

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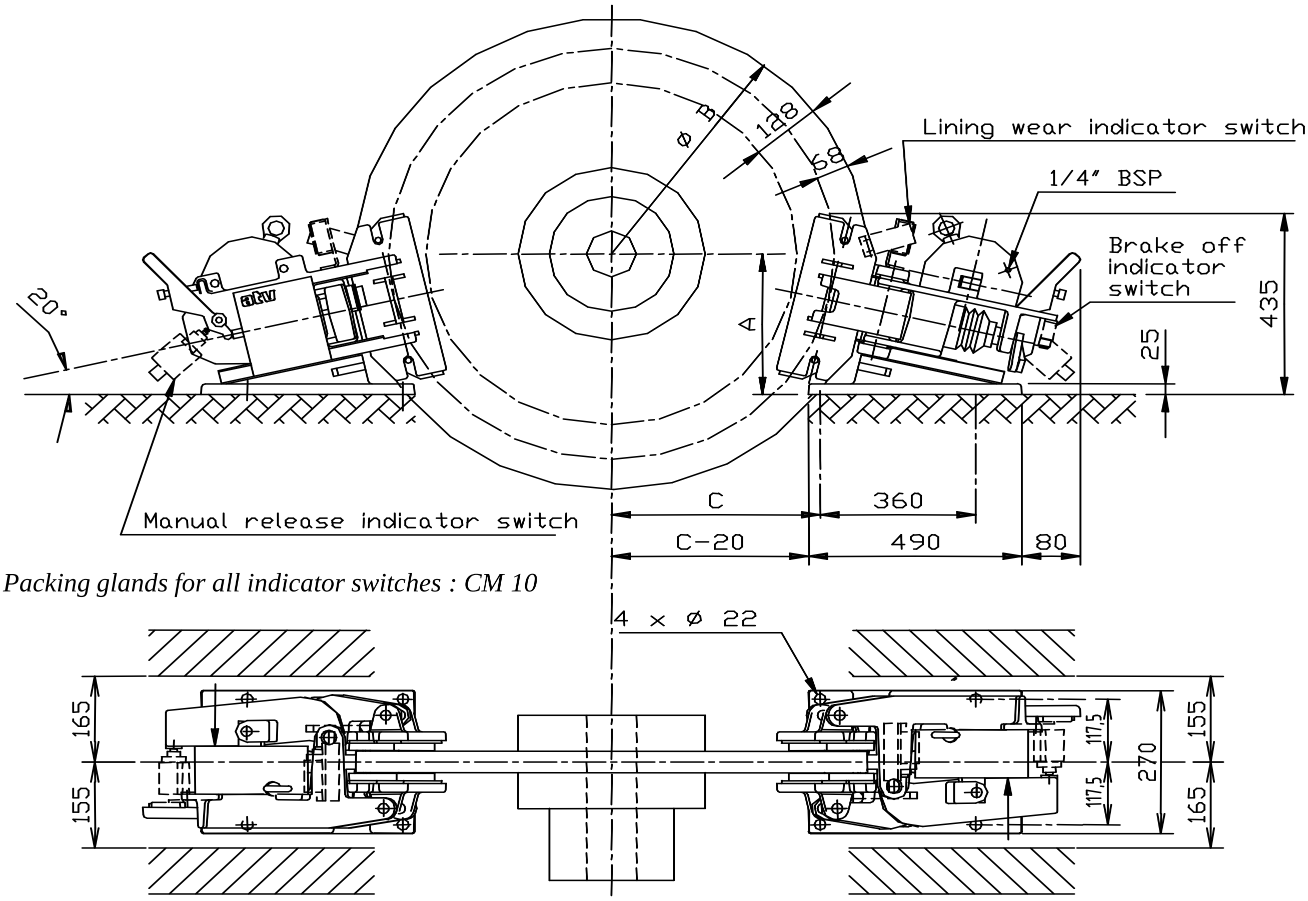
3 SP

FAIL SAFE DISC BRAKE

Spring braking - Pneumatic release - Disc thickness: 12,7 to 30mm



Packing glands for all indicator switches : CM 10

Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 3 SPRM)

With automatic lining wear adjustment (REF : 3 SP)

Brake disc diameter ØB	mm	445	495	550	625	705	795
Braking torque	N.m	1600	1820	2100	2500	2900	3350
Braking force	N	10170	Adjustable from 50% à 120%				
Max Reaction force	N	1 Caliper : 12200 N - 2 Calipers : 8350 N					

CALIPER *For non standard discs : please contact ATV*

A	mm	285	294	305	315	330	345
C	mm	100	124	150	185	225	265

Release pressure	bar	5
Response time	s	0,2
Weight	kg	122

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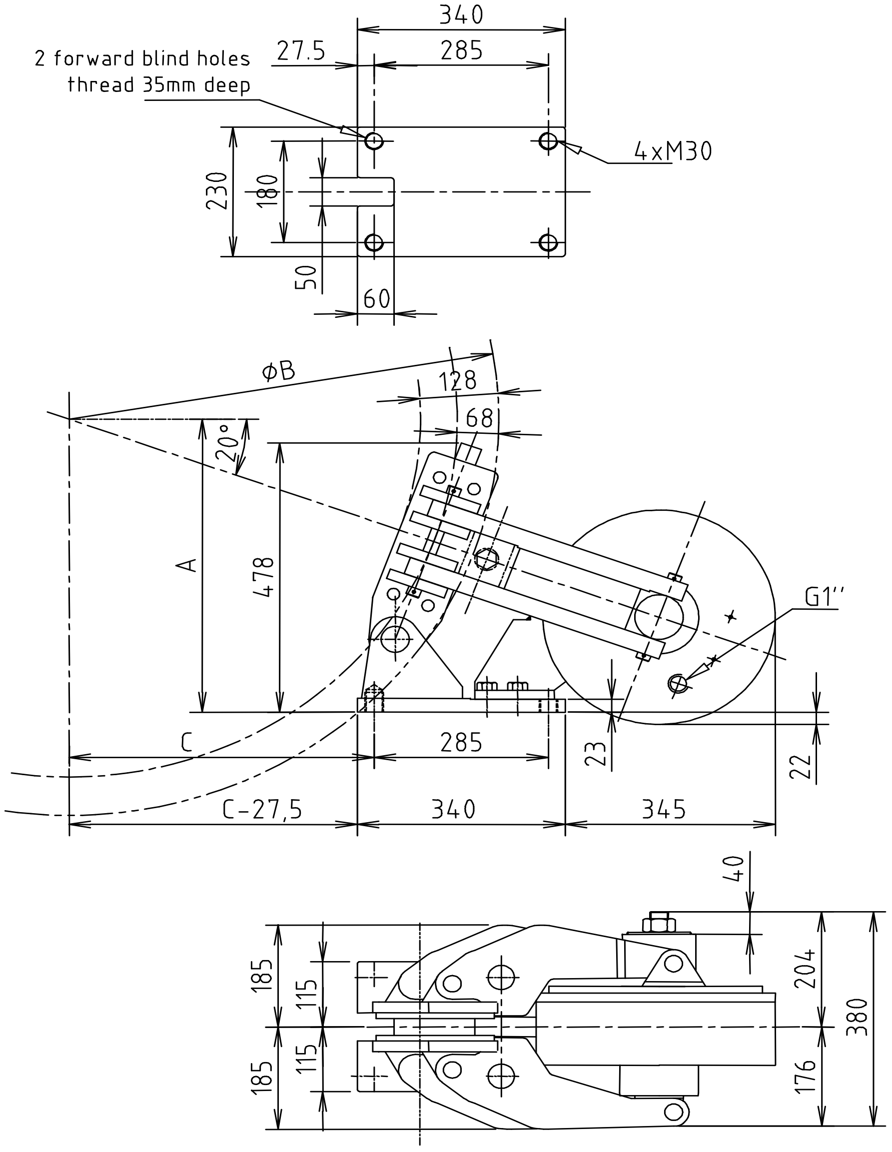
ST2 SP

FAIL SAFE DISC BRAKE

Sping braking - Pneumatic release - Disc thickness : 30 mm



Dimensions and data open to improvement

Braking torque (Nm) = Braking force / 1000 x [(ØB)/2-68]

MAXIMUM BRAKING FORCE	N	70 000

CALIPER		
Release pressure	bar	6
Response time	s	0,2
Weight	kg	150
A	mm	= (0,171 x ØB) + 279
C	mm	= (0,470 x ØB) - 161

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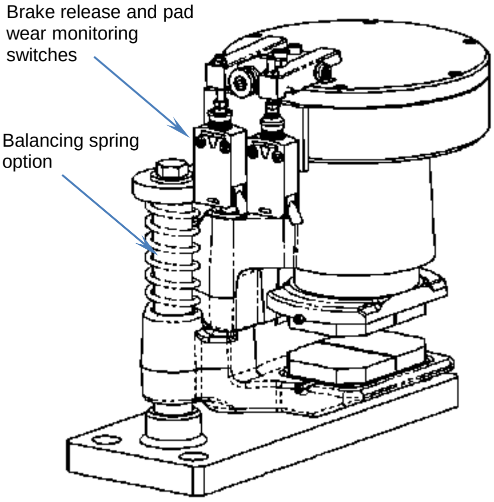
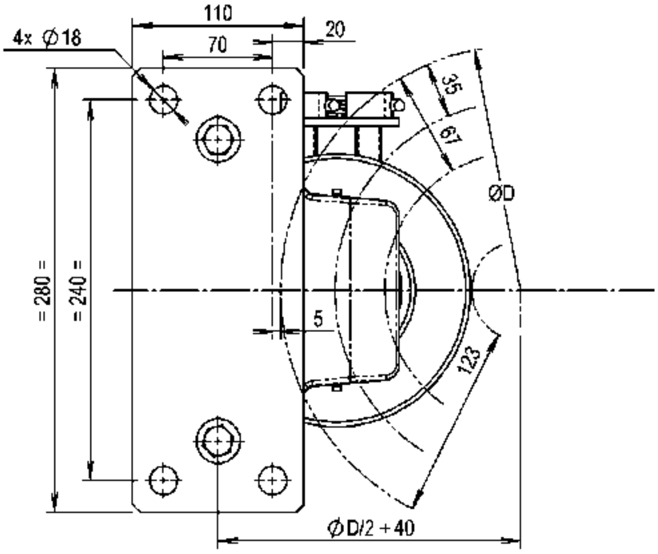
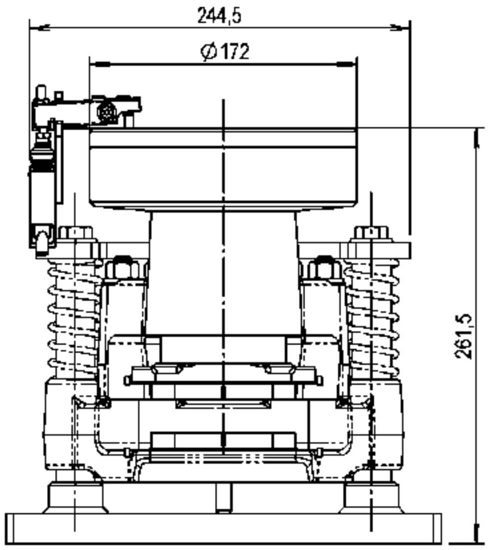
S9 SP

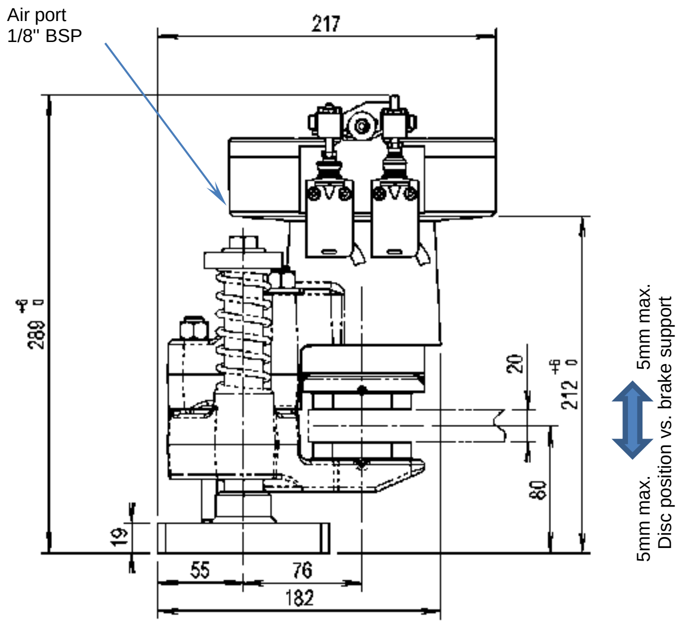
FAIL-SAFE DISC BRAKE

Spring applied - Pneumatic release









Data open to improvement

Instruction handbook N°265

Technical features:

Braking force²:	*kN*	**10,5**
Total gap between pads and disc (nominal value):	*mm*	1
Response time:	*s*	0,2
Release pressure:	*bar*	10
Maximal pressure:	*bar*	20
Disc thickness:	*mm*	20
Weight:	*kg*	24

² Braking torque loss at 1mm pad wear: 6%

Braking torque: Cf [Nm] = 10,5 x Rf
Braking radius: Rf [mm] = (ØD/2) -35
Torque increases by up to 12% in dynamic mode (refer to ATV)

Lifting ring not included

Fixation : 4x M16 screws Class 8.8 (not supplied)
Cs : 190 Nm ±10% µ 0,15

Working conditions :

Ambient temperature:	-20° / +60°C
Humidity:	< 90 %

Monitoring switches:
240V 1,5A AC ; 250V 0,1A DC
Wire 5 x 0.75mm², length 2m., Øext 7.5mm
IP67 protection

Options :
- Floating caliper alone delivered (no bracket)
- Balancing springs
- Inductive switches
- Pads fitted with wear wire or sintered (for high temp.)
- Seawater execution
- Low temperature execution
- Off-shore certifications
- ATEX certifications for explosive atmospheres

Calculation notes or 3D models available on request

DIRECT ACTION BRAKES

D

HYDRAULIC DIRECT ACTION BRAKES

D1

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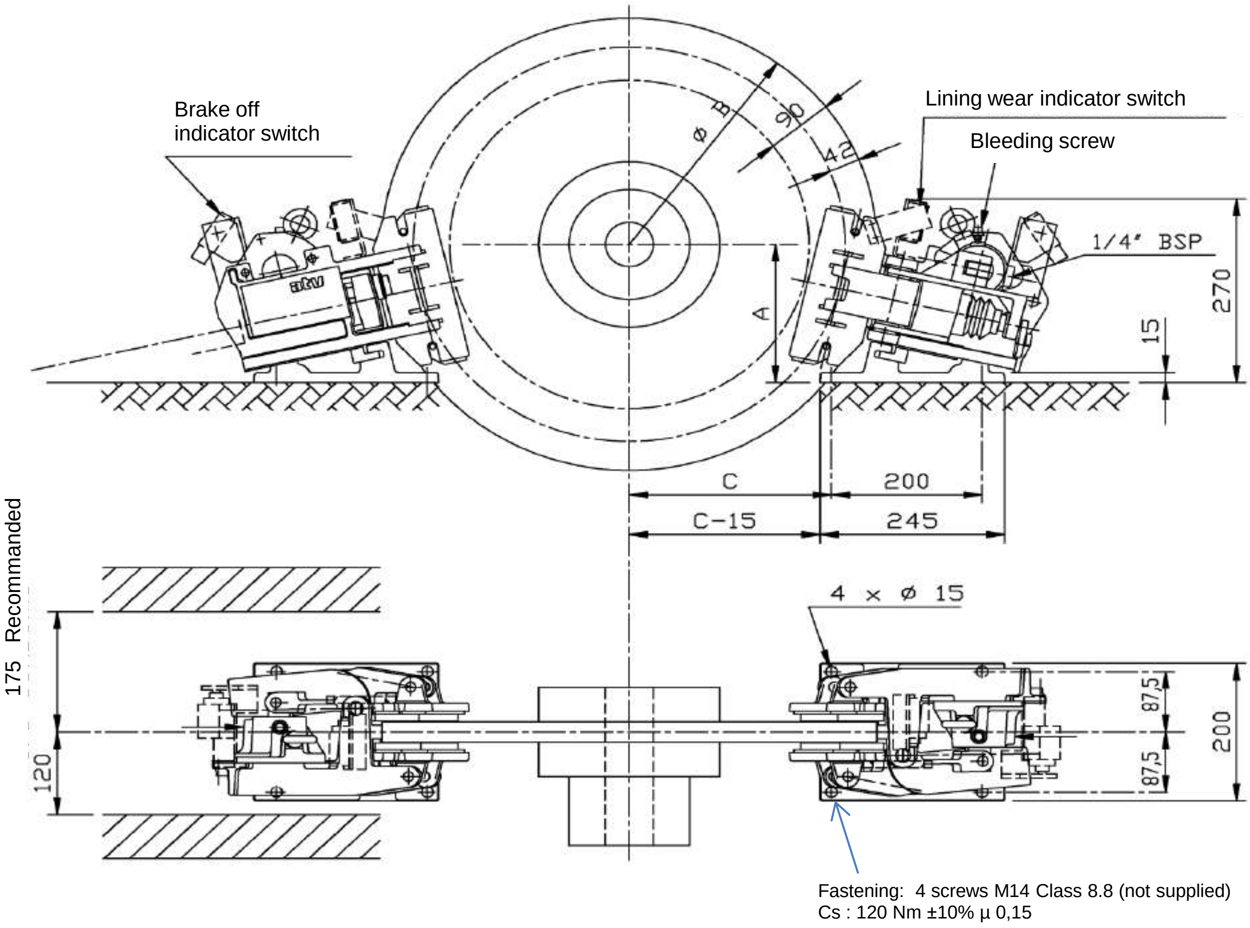
5 ADH

HYDRAULIC DIRECT ACTION DISC BRAKE

Hydraulic pressure braking - Disc thickness : 12,7 to 30mm



Data open to improvment

Drawing file Nr 12181

Handbook Nr 278 (Automatic wear adjustment => Ref.: 5ADH)

Power pack definition : see leaflet Nr 262

Technical features:

Braking force:	*N*	**640**	**890**	**1 150**	**1 400**	**1 650**
Hydraulic pressure:	*bar*	25	35	45	55	65
Total gap between pads and disc (nominal value):	*mm*	0,7				
Max. pressure:	*bar*	80				
Displaced volume for complete braking:	*cm³*	< 2				
Weight:	*kg*	27				
Max. reaction force: *1 caliper : 1980N - 2 calipers: 890N*						

Working conditions :

Ambient temperature:	-20° / +60°C
Humidity:	< 90 %
Dusty ambience :	≥ 65µ

Braking torque : Cf [Nm] = Braking force x Rf / 1000

Braking radius Rf [mm] = (ØD/2) -42

With disc:	A [mm]	C [mm]	Cf [Nm]
Ø 315 mm	160	100	230
Ø 355 mm	165	120	265
Ø 395 mm	170	140	315
Ø 445 mm	180	160	360
Ø 495 mm	186	190	410
Ø 550 mm	195	220	470
Ø 625 mm	205	255	550

*For different Ø => **Contact ATV***

Monitoring switches :

240V 1,5A AC ; 250V 0,1A DC

PG11 cable gland

IP66 protection

Options :

- Manual wear adjustment (Réf.: 5ADHRM)
- Opennig switch
- Wear switch

Calculation notes or 3D models available on request

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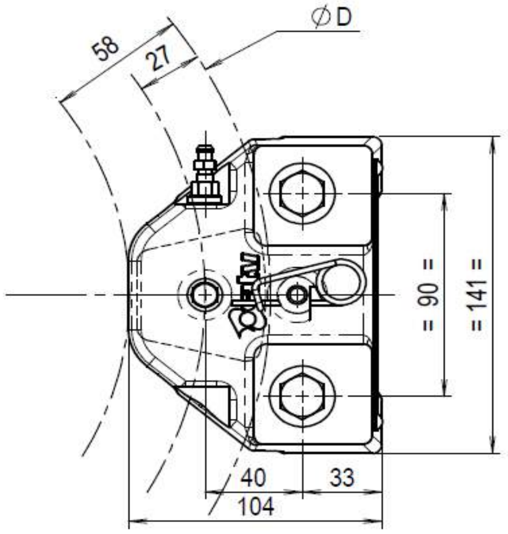
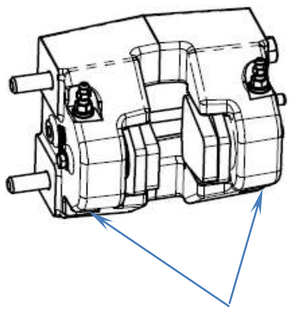
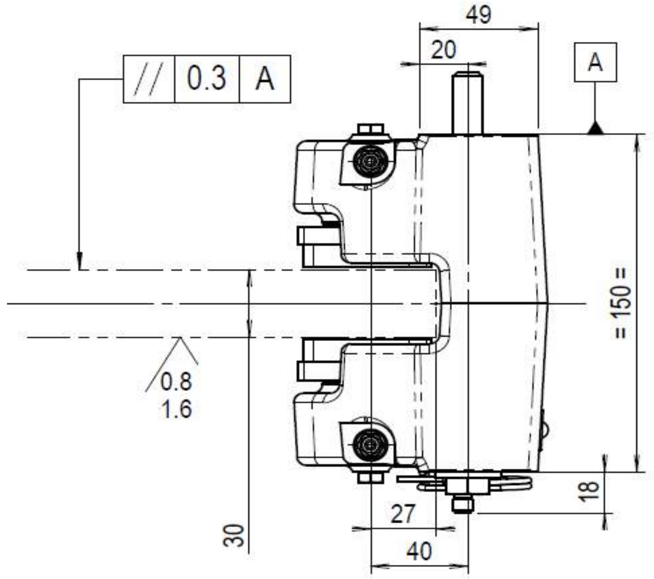
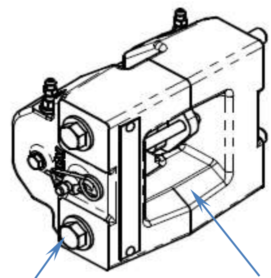
DADH10

HYDRAULIC DIRECT ACTION DISC BRAKE









Data open to improvement

Files nr 12728
Instruction handbook nr 266
Power pack definition: see leaflet nr 262

Technical features:

Braking force:	*N*	**7 000**	**8 000**	**9 000**	**10 000**
Hydraulic pressure	*bar*	140	160	180	200

Total gap between pads and disc (nominal value):	*mm*	2
Maximal wear on each lining:	*mm*	8
Response time:	*s*	<0,1
Maximal pressure:	*bar*	230
Displaced volume for complete braking:	*cm³*	2
Volume total (worn linings):	*cm³*	13
Disc thickness:	*mm*	30
Weight:	*kg*	8,5

Working conditions :

Ambient temperature:	-20° / +40°C
Humidity:	< 90 %

Options :
- Set of bolts (screws + washers)
- Brake support
- Pads fitted with wear wire
- Pads sintered (for high temp.)
- Seawater execution
- Hydraulic power pack

Braking torque **:** Cf [Nm] = Braking force x Rf / 1000
Braking radius Rf [mm] = (ØD/2) -27
Torque increase by up to 10% in dynamic mode (refer to ATV)

Fastening : 2x M12 screws Class 8.8 (not supplied)
Cs : 69 Nm ±10% µ 0,15

Calculation notes or 3D models available on request

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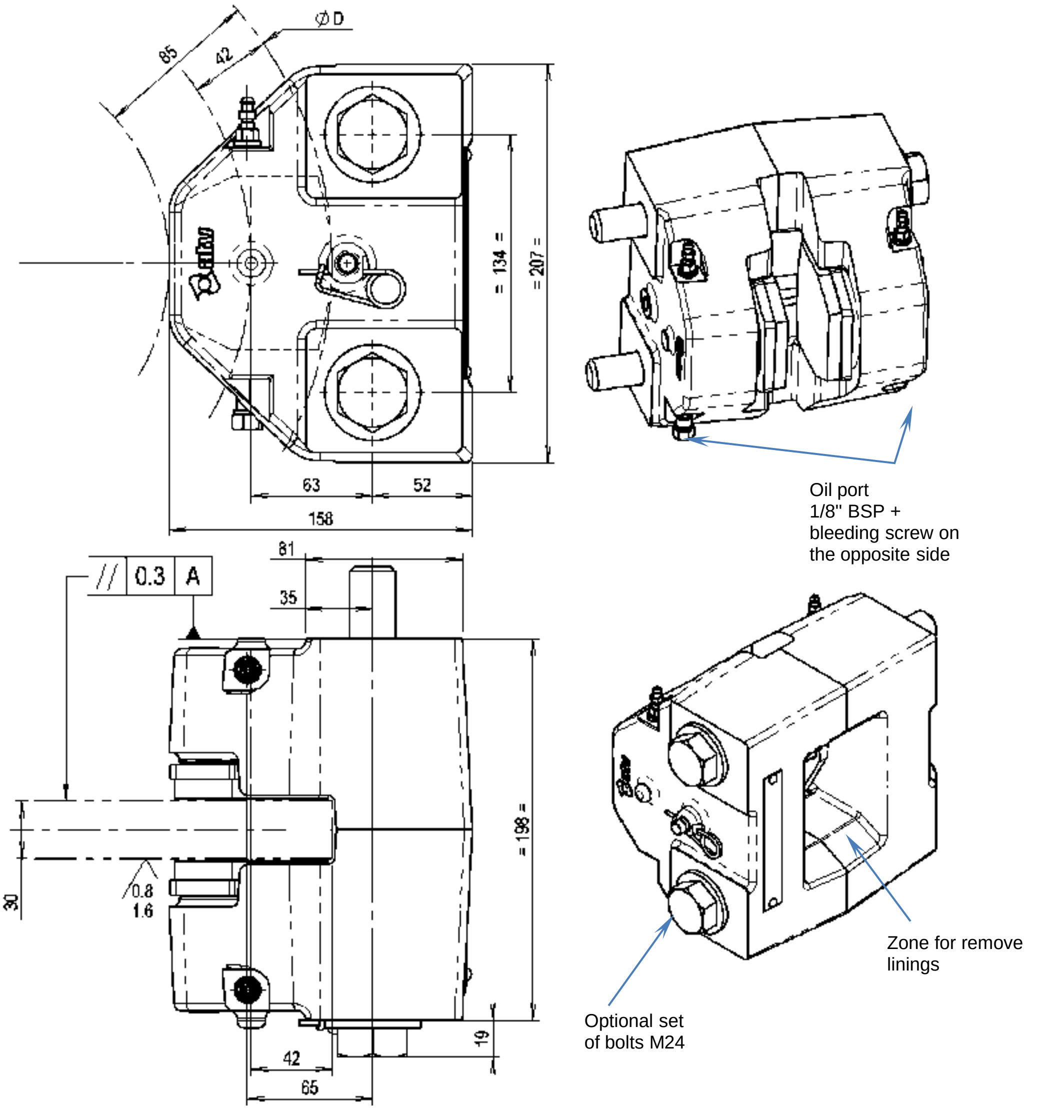
DADH 30

HYDRAULIC DIRECT ACTION DISC BRAKE



Data open to improvement

Files nr 12734
Instruction handbook nr 266
Power pack definition: see leaflet nr 262

Technical features:

Braking force:	*N*	**22 000**	**25 000**	**28 000**	**30 000**
Hydraulic pressure	*bar*	140	160	180	200

Total gap between pads and disc (nominal value):	*mm*	2
Maximal wear on each lining:	*mm*	8
Response time:	*s*	<0,1
Maximal pressure:	*bar*	230
Displaced volume for complete braking:	*cm³*	5
Volume total (worn linings):	*cm³*	45
Disc thickness:	*mm*	30
Weight:	*kg*	15

Braking torque **:** Cf [Nm] = Braking force x Rf / 1000
Braking radius Rf [mm] = (ØD/2) -42
Torque increase by up to 10% in dynamic mode (refer to ATV)

Fastening : 2x M24 screws Class 8.8 (not supplied)
Cs : 640 Nm ±10% µ 0,15

Working conditions :

Ambient temperature:	-20° / +40°C
Humidity:	< 90 %

Options :
- Set of bolts (screws + washers)
- Brake support
- Pads fitted with wear wire
- Pads sintered (for high temp.)
- Seawater execution
- Hydraulic power pack

Calculation notes or 3D models available on request

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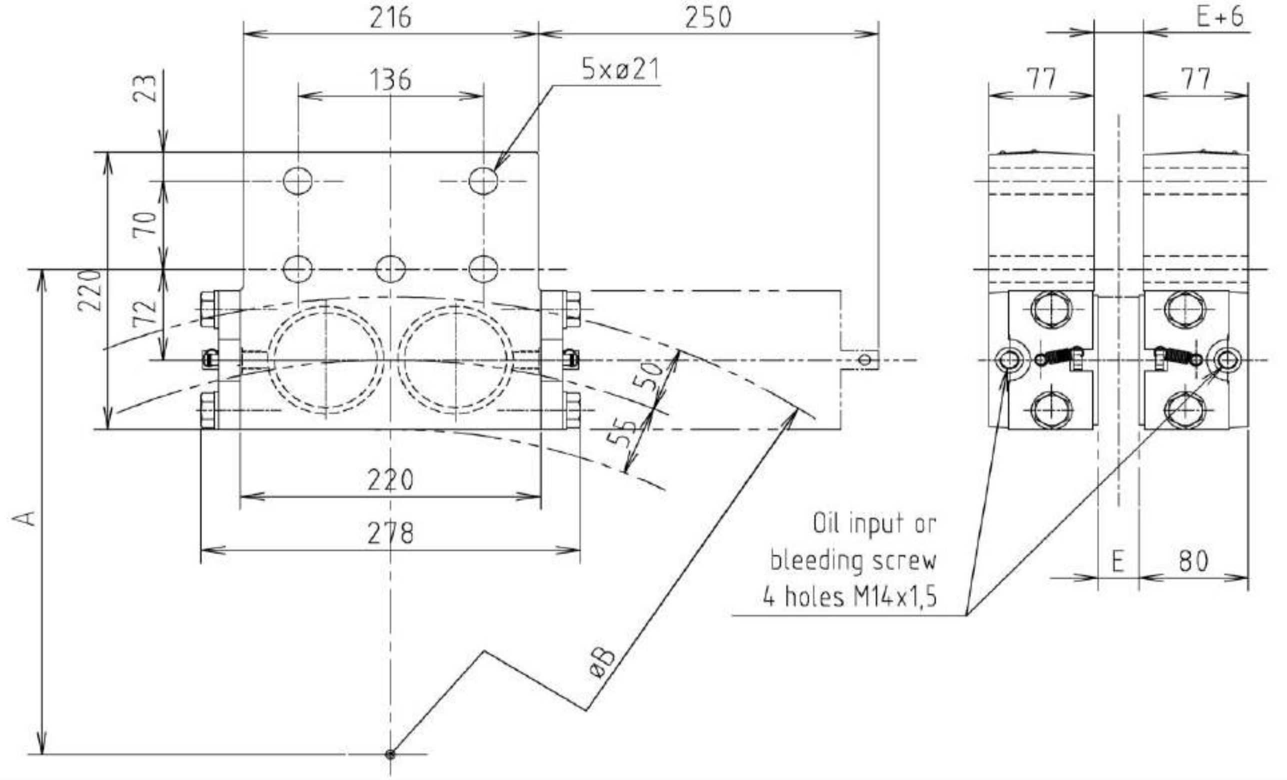
DADH75

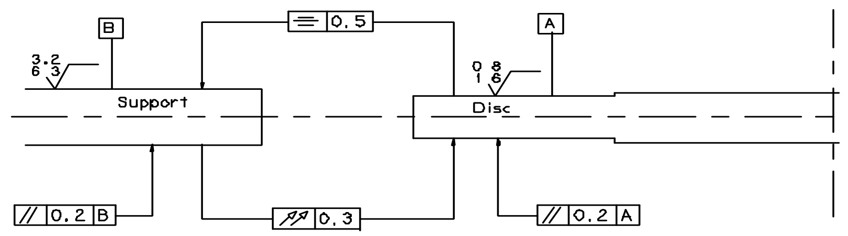
HYDRAULIC DIRECT ACTION DISC BRAKE

- FASTENING -
5 screw M 20 : Class 10-9
Tightening torque : 430 N.m



Dimensions and Data open to improvement

Installation



Braking torque (N.m) = Braking force / 1000 x [(ØB)/2 - 50]

BRAKING FORCE						Max.
Service pressure	bar	30	60	100	160	200
	N	19 000	38 000	63 000	101 000	127 000

CALIPER			
Displaced volume for complete braking	cm³	17	(4,25 cm³ per piston)
Total volume (worn linings)	cm³	176	(44 cm³ per piston)
Response time		< 0,1	
Weight	kg	60	
A	mm	= (ØB)/2 + 22	

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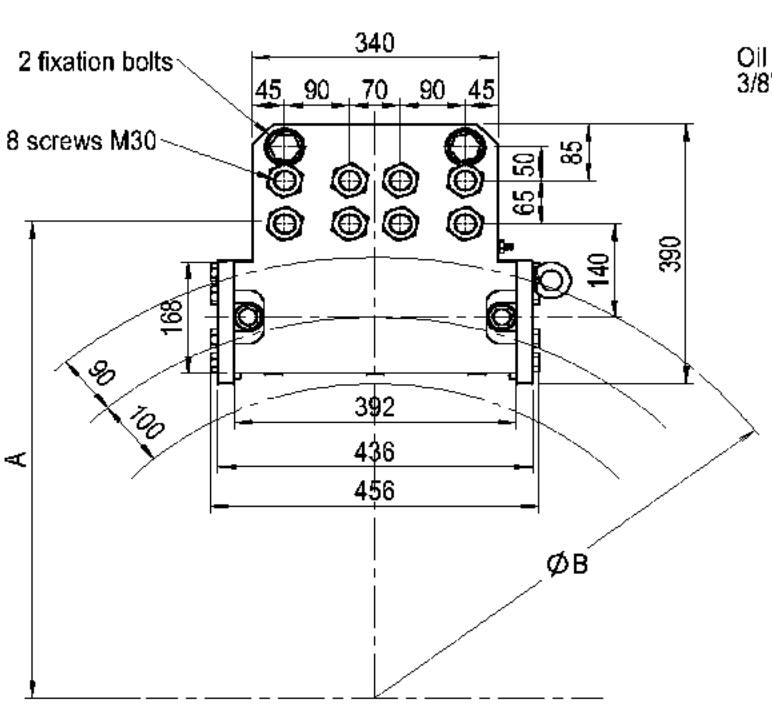
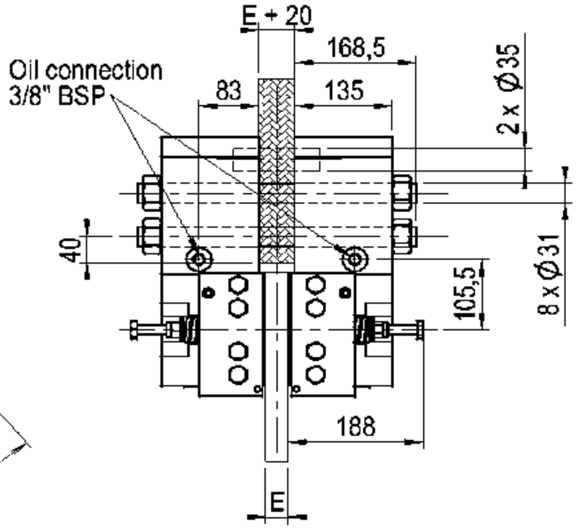
DADH350

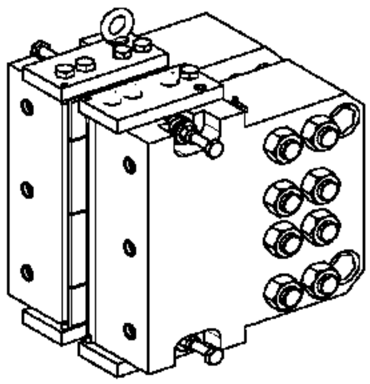
HYDRAULIC DIRECT ACTION DISC BRAKE

- FASTENING -
8 screws M 30
Tightening torque : 1500 Nm
+ 2 fixation bolts

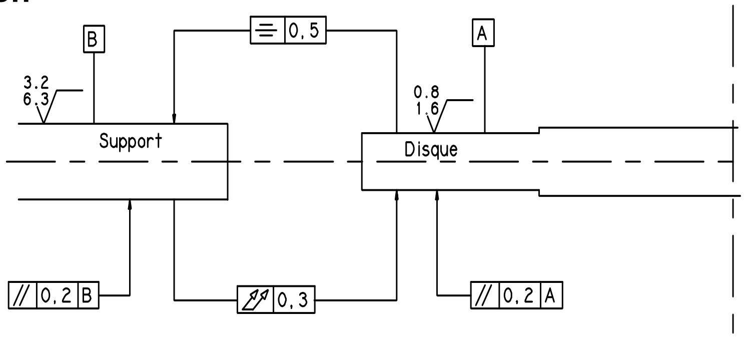




Dimensions and Data open to improvement



Installation



Braking torque (N.m) = Braking force / 1000 x [(ØB/2 - 90]

BRAKING FORCE					
Service pressure	bar	160	180	200	
	N	330 000	370 000	410 000	

CALIPER			
Displaced volume for complete braking	cm³	180	(With 1mm gap)
Total volume (worn linings)	cm³	1100	(8mm of wear per lining)
Response time	s		according to volume
Weight	kg	280	(With fixation screws)
A	mm	= (ØB)/2 + 50	

ELECTRIC DIRECT ACTION BRAKES

D3

5 ADE

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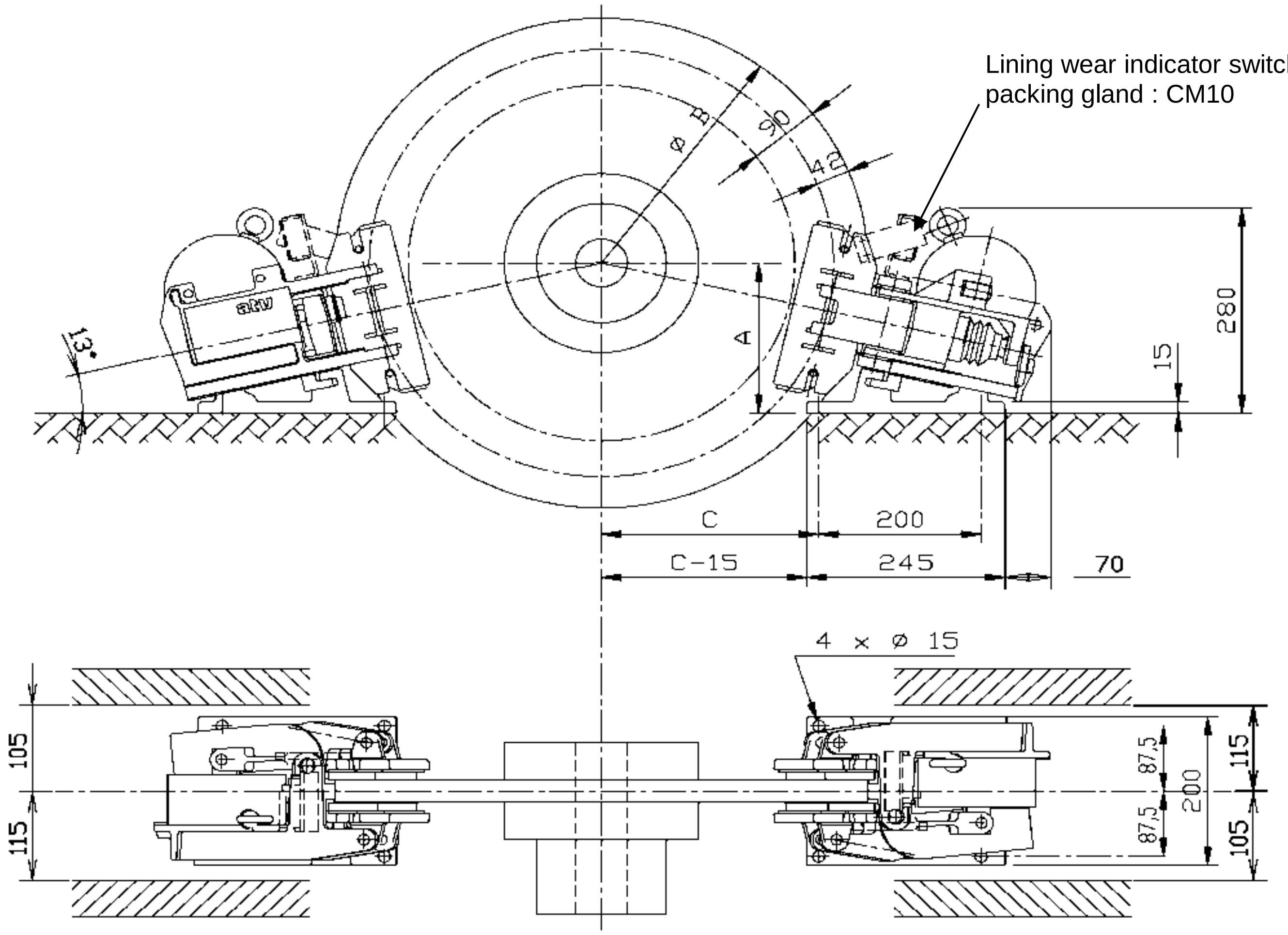
ELECTRIC DIRECT ACTION DISC BRAKE

Electric current applied



Dimensions and Data open to improvement

Without automatic lining wear adjustment (REF : 5 ADERM)
For power supplier, please contact ATV

Brake disc diameter ØB	mm	315	355	395	445	495	550	625
Braking torque	N.m	190	220	260	300	340	390	460
Braking force	N	1650	Adjustable from 50% to 120%					
Maxi Reaction force	N	1 Caliper : 1980 N - 2 Calipers : 890 N						
CALIPER								
Power consumption	W	100 Voltage 24 V DC						
Response time	s	0,2						
Weight	kg	34						
A	mm	160	165	170	180	186	195	205
C	mm	100	120	140	160	190	220	255

For non standard discs : please contact ATV

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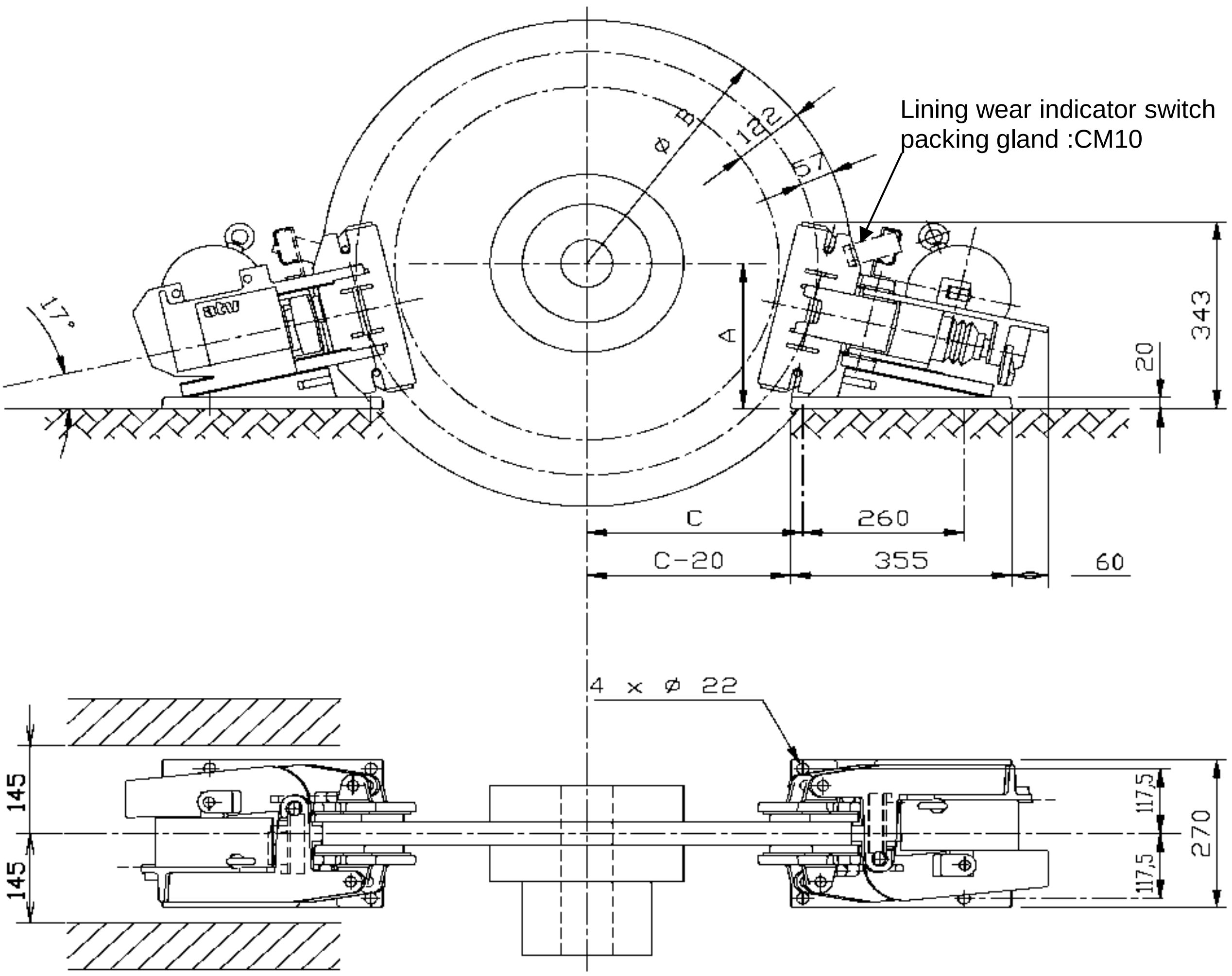
4 ADE

ELECTRIC DIRECT ACTION BRAKE
Electric current applied



Dimensions and Data open to improvement

With automatic lining wear adjustment (REF : PIN4E-24-M)
For power supplier, please contact ATV

Brake disc diameter ØB	mm	445	495	550	625	705	795
Braking torque	N.m	950	1120	1270	1500	1750	2000
Braking force	N	5880	Adjustable from 50% to 120%				
Maxi Reaction force	N	1 Caliper : 7060 N - 2 Calipers : 4130 N					

CALIPER							
Power consumption	W	115 under voltage of 24 V (voltage from 0 to 24 V)					
Response time	s	0,2					
Weight	kg	77					
A	mm	225	232	240	250	260	275
C	mm	130	154	180	215	255	295

For non standard discs : please contact ATV

SUPPLYING UNITS

F

ELECTRIC POWER SUPPLIERS

F1

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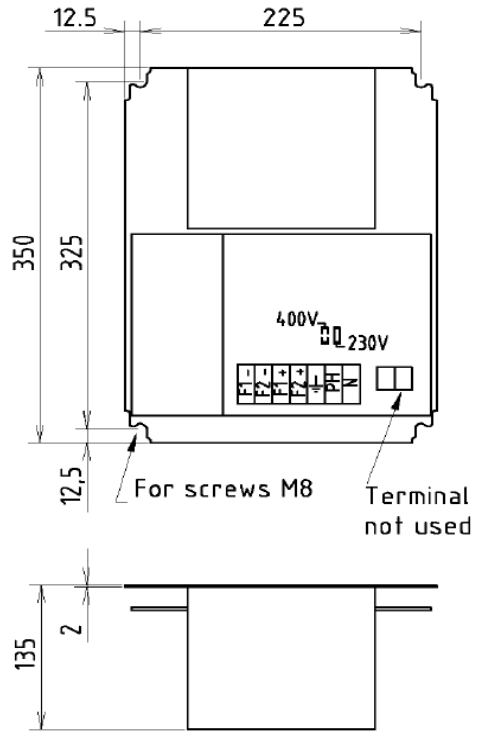
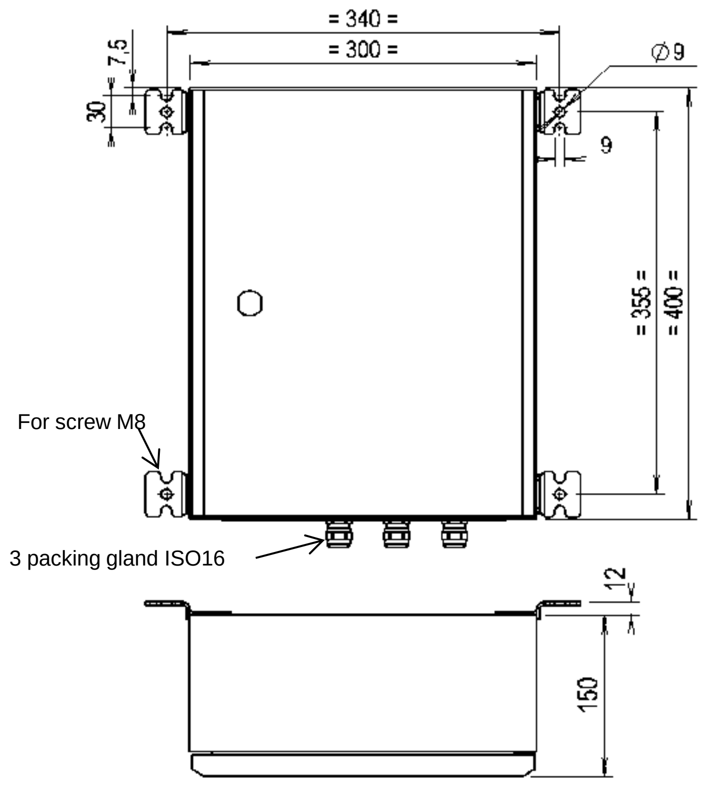
ESP 5850
ESE 6850

ELECTRIC POWER SUPPLIER

ESP 5850 Without box

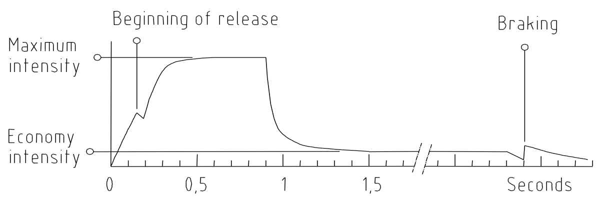
ESE 6850 In box





Data open to improvement

Output voltage curve



Handbook nr 026

Technical features :		**ESP 5850**	**ESE6850**
Protection :		IP00	IP66 / IK10
Weight :	kg	12	16

Working conditions :

Ambient temperature :	-20°C to +60°C
Humidity :	< 90%

Electrical features :

Supply voltage single phase	*Vac*	230/400	50-60 Hz
Release voltage (Off-load) :	*V*	65	(Internal R = 0,3 Ohm)
Economy voltage (Off-load) :	*V*	10	(Internal R = 0,3 Ohm)

Maximum connecting cable resistance : 0,5 Ohm per caliper

Options :
- Special input voltage
- Marinised
- With fan
- Without fast action card

Other options and 3D models available on request

Type of caliper	561SE		560SE		56SE		5SE		450SE	4SE	3SE
Number	1	2	1	2	1	2	1	2	1	1	1
Cycles per hour f=60% at 40°C	150	150	150	150	150	150	450	750	450	450	450
Release power (VA)	320	600	400	730	1400	2250	640	1120	1800	1690	2200
Economy power (VA)	15	35	20	45	100	185	40	80	130	130	175
Fuse 230V (aM)	6	6	6	6	6	10	6	6	8	8	10
Fuse 400V (aM)	4	4	4	4	4	8	4	4	6	6	8

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ESP 51850
ESE 61850

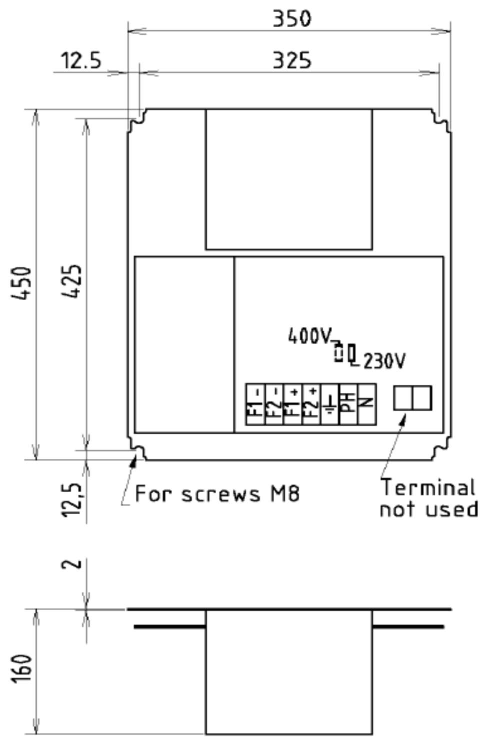
ELECTRIC POWER SUPPLIER

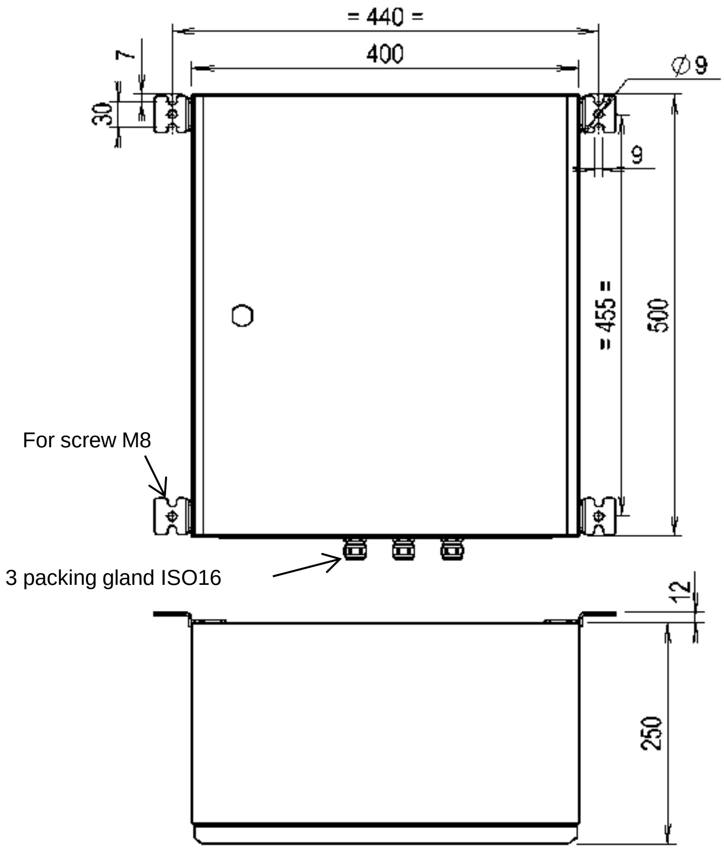
ESP 51850

Without box

ESE 61850

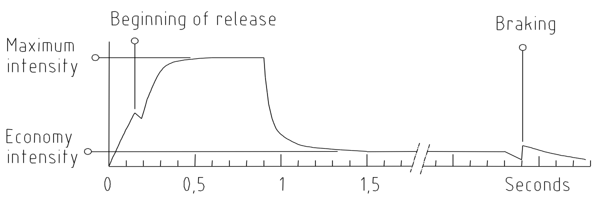
In box





Data open to improvement

Output voltage curve



Handbook nr 026

Technical features :		**ESP 51850**	**ESE61850**
Protection :		IP00	IP66 / IK10
Weight :	kg	25	36

Working conditions :
Ambient temperature : -20°C to +60°C
Humidity : < 90%

Electrical features :
Supply voltage single phase *Vac* 230/400 50-60 Hz
Release voltage (Off-load) : *V* 65 (Internal R = 0,2 Ohm)
Economy voltage (Off-load) : *V* 10 (Internal R = 0,11 Ohm)
Maximum connecting cable resistance : 0,1 Ohm per caliper

Options :
- Special input voltage
- Marinised
- With fan
- Without fast action card

Other options and 3D models available on request

		ESP 51850 / ESE 61850							ESP 51852 / ESE 61852		
Type of caliper		**5SE**		**450SE**		**4SE**		**3SE**		**ST1SE**	**ST2SE**
Number		1	2	1	2	1	2	1	2	1	1
Cycles per hour f=60% at 40°C		1000	1000	450	450	600	600	450	450	100	100
Release power	*VA*	1200	1650	1950	3400	1900	3400	2700	4350	6700	6700
Economy power	*VA*	75	110	125	260	100	260	200	350	500	500
Fuse 230V	(aM)	16	16	16	16	16	16	16	20	20	20
Fuse 400V	(aM)	10	10	10	10	10	10	10	16	16	16

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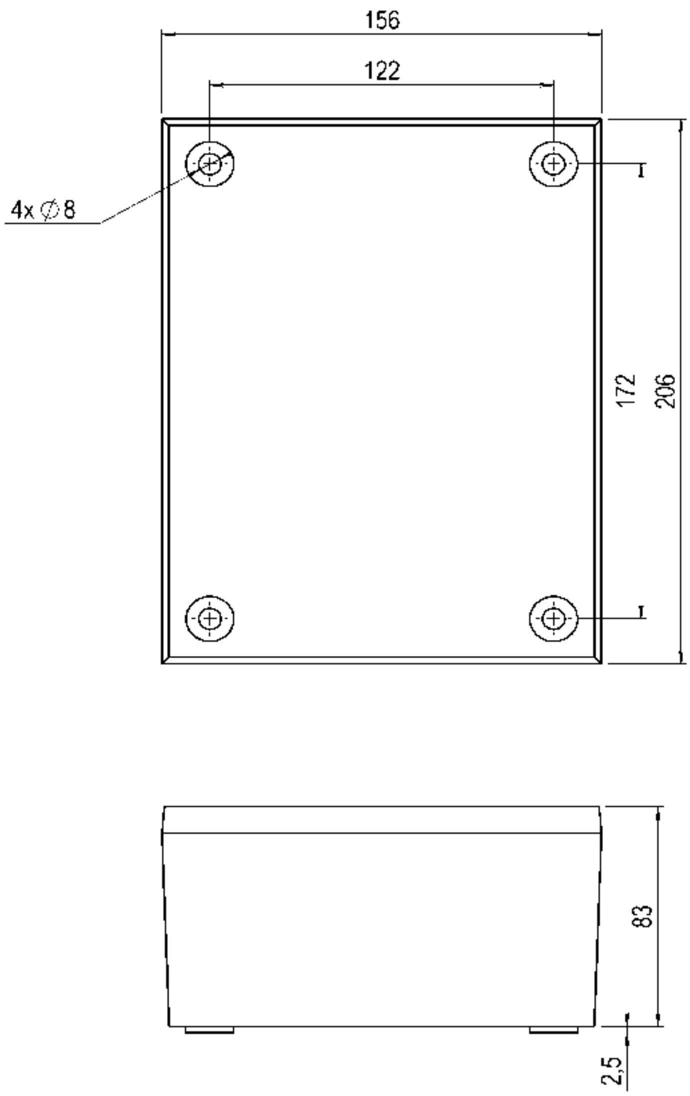
ADC 24V / 48V

24V/48V CONTROLLER FOR ELECTROMAGNETIC BRAKE



Data open to improvement

File # 12732
Instruction handbook # 261

Technical features :

Protection :		IP55
Weight :	Kg	1,3

Working conditions :

Ambient temperature :	-20°C to +60°C
Humidity :	< 90%

Electrical features :

Supply voltage :	*Vcc*	24	48
Release voltage :	*V*	24	48
Economy voltage :	*V*	4	8
Max. power :	*W*	2200	2200
Brake coil voltage	*Vcc*	24	65

Operating:

Brake controller delivers its max power
during one second and then switches to the economy voltage.

Electrical protection : aM fuse acc. to CEI 60269-2
To protect upstream by circuit breaker
type D conform to IEC 947,2

Duty cycles : 600 cycles per hour
at duty ratio f = 60%

Other options and 3D models available on request

Appareils de Transformation de Vitesse

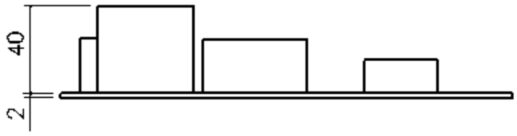
Direction Technique et Commerciale Paris
54, Route de Sartrouville
F 78230 Le Pecq
Tel : (33) - 1 - 30.15.41.00.
Fax : (33) - 1 - 30.15.41.19.

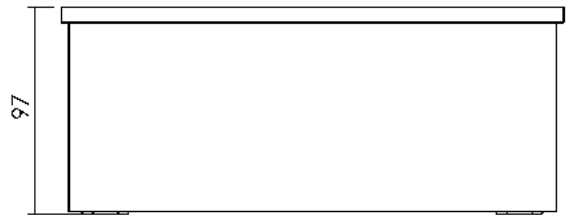
APCD 24 B

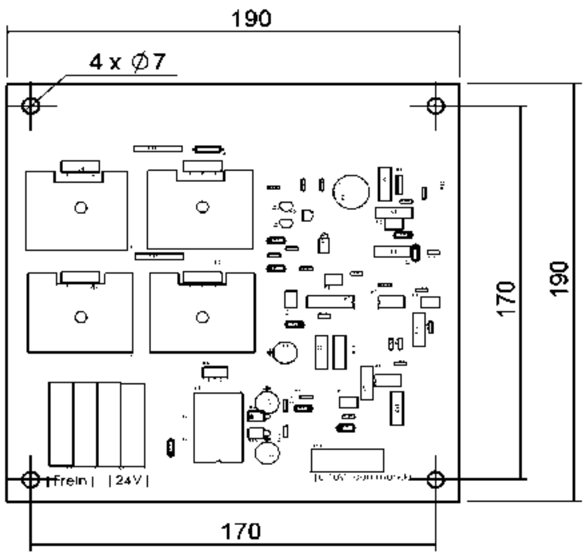
24V PROGRESSIVE ELECTRIC POWER SUPPLIER

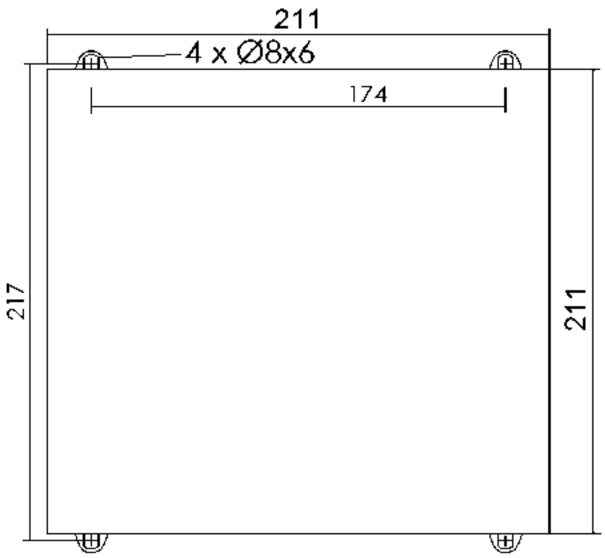
<u>Function:</u>
When current is on the supplier provides 24V release voltage during 0,7sec and then switches over to 4V hold voltage.

The voltage variation of the in put signal allows the variation of the output voltage and the adjustment of the braking force.









Dimensions and Data open to improvement

The braking force is proportional to the input signal
The braking force can be regulated.

Command voltage	Between 10 et 24V
Progressive input signal	From 0 to 10V
Supply voltage	24V DC
Release voltage	24V
Hold voltage	4V
Max. power	2000W
Protection	IP 66 ; IK 08
Cycles per hour	600 Cycles per hour f=60%
Fuse	Must be protected with 30A motor fuse
Weight	1kg

HYDRAULIC POWER UNITS

F2

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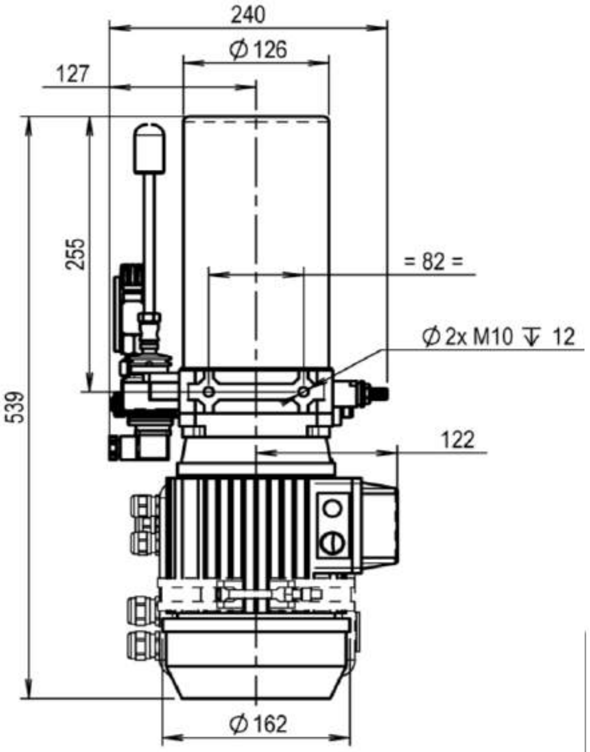
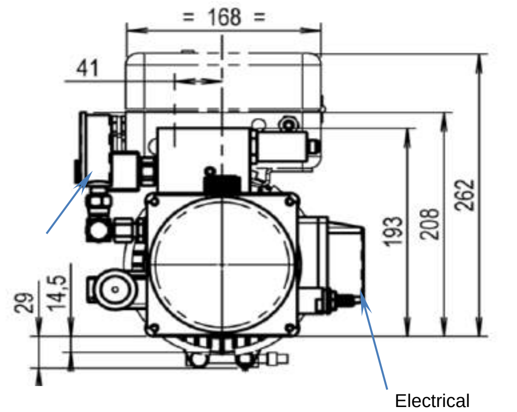
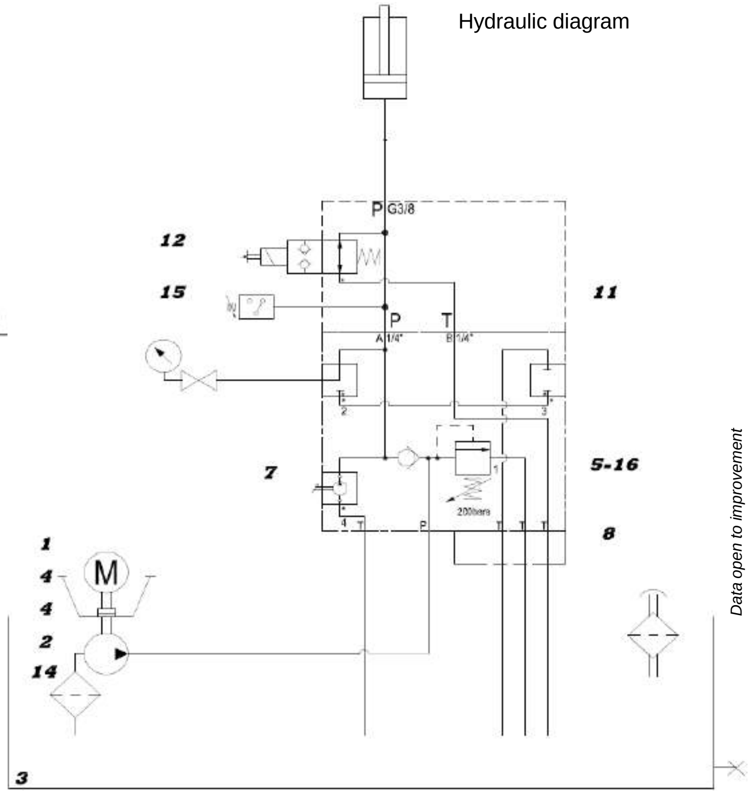
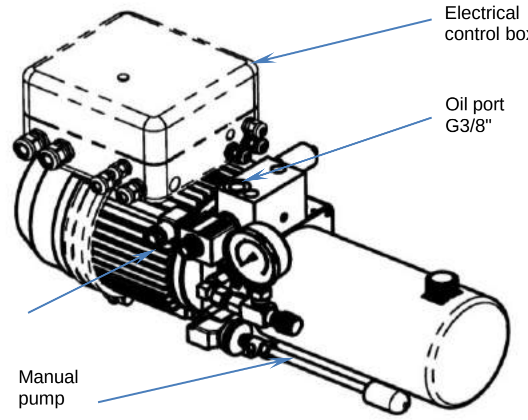
TP3

TP3 HYDRAULIC POWER PACK









Data open to improvement

Drawing file Nr 12704

Technical features:

Max pressure:	*bar*	230
Pump flow rate:	*l/min*	1,7
Motor power:	*kW*	0,75
Electrovalve and pressure switch voltage:	*Vdc*	24
Tank capacity:	*litre*	2,5
Oil charge:	*litre*	2
Nominal voltage (threephase):	*Vac - Hz*	3x400 - 50
Weight (empty tank):	*kg*	16

Working conditions:

Ambient temperature:	-20° / +40°C
Humidity:	< 90 %
Protection:	IP55
Assembly position:	Horizontal

Options :

- Protective cover
- Electric control box

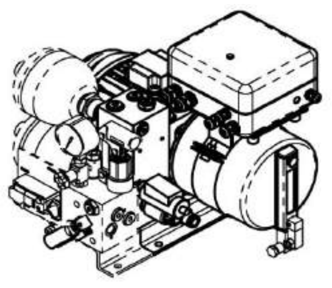
Pressure is supplied when electric supply is on.
Pump stops when pressure top threshold is reached.
Pressure is released when electric supply is switched off

Mounting : 2 screws M10 Class 8.8 (not supplied)

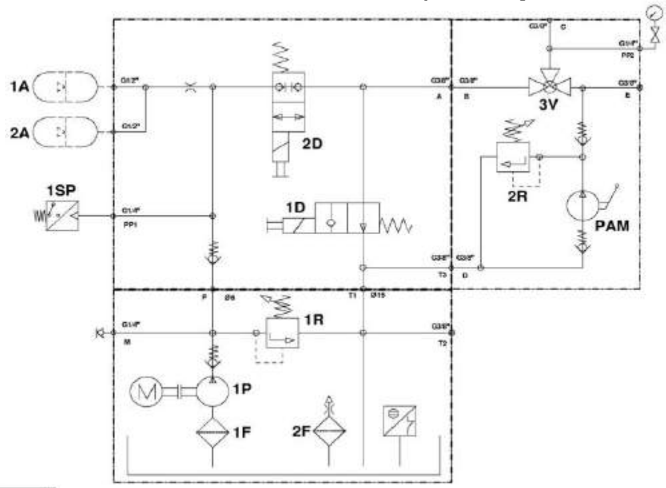
Other options and 3D models available on request
Instruction hanbook Nr. 276

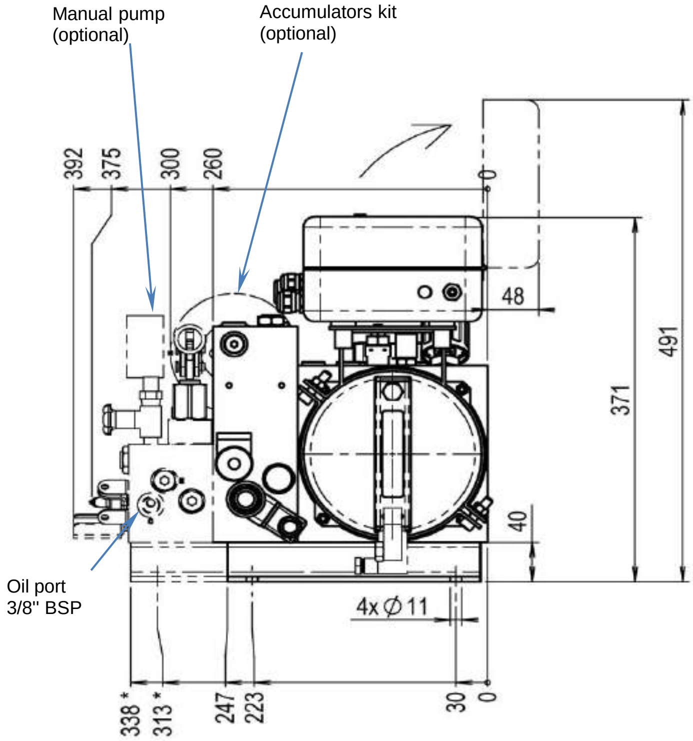
CO2R

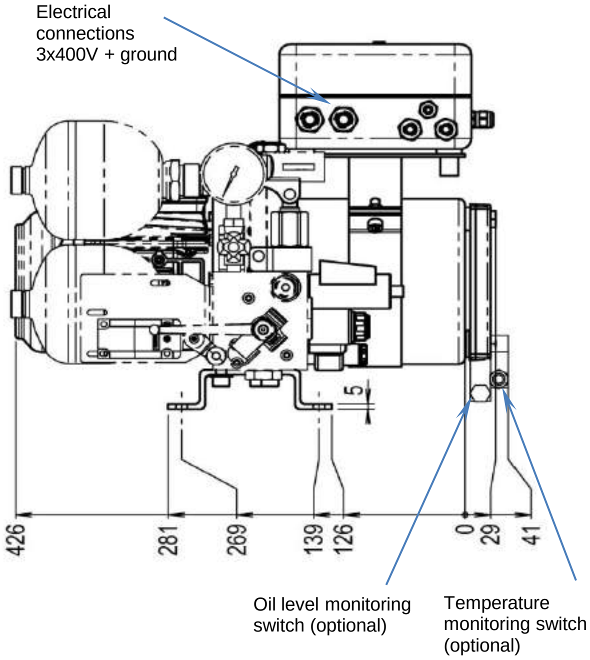
CO2R HYDRAULIC POWER PACK



Hydraulic diagram







Drawing file Nr 12704

Data open to improvement

Technical features :			optional	optional
Max pressure :	*bar*	230	230	180
Pump flow rate :	*l/min*	1,3	2,6	4,8
Motor power :	*kW*	0,55	1,5	1,5
Tank capacity :	*litre*		2,5	
Oil charge :	*litre*		2	
Nominal voltage (threephase) :	*Vac - Hz*		3x400 - 50	
Weight (empty tank without options) :	*kg*		20	

Inludes an integrated control card
Pressure is supplied when the voltage is activated.
Pump stops when pressure top threshold is reached.
Pressure is released when the voltage is switched off

Mounting : 4 screws M10 Class 8.8 (not supplied)
* : Dimension with filter pressure or manual pump option

Working conditions :

Ambient temperature :	-20° / +40°C
Humidity :	< 90 %
Protection :	IP55
Assembly position :	Horizontal

Options :
- Accumulators kit
- Integrated manual pump
- 3-ways valve position monitoring switches
- Oil level contact switch
- Oil temperature monitoring switch
- Pressure filter
- Air conditioner filter
- Flow limiter
- Oil heater / Oil circulation
- Discharge valve redondancy

Other options and 3D models available on request
Instruction hanbook Nr. 268

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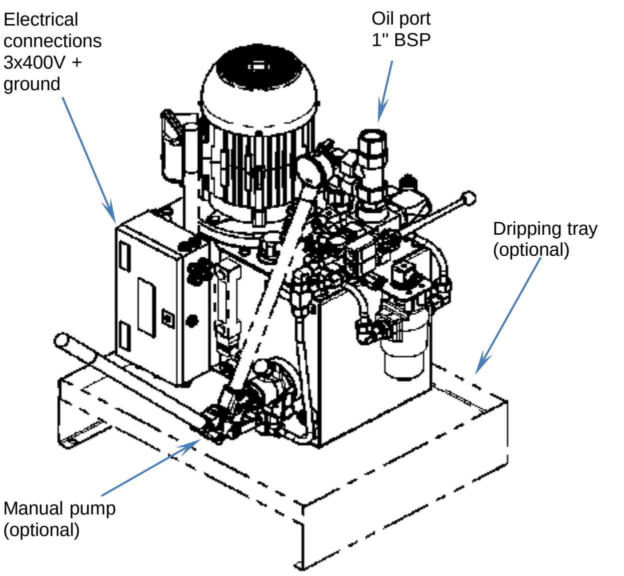
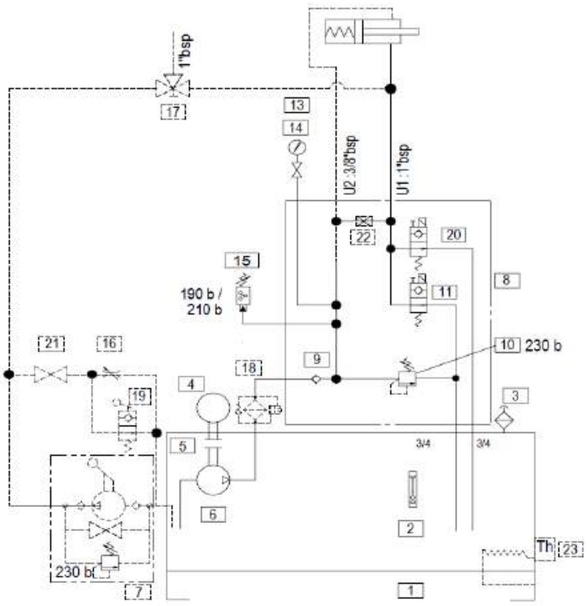
ATV114

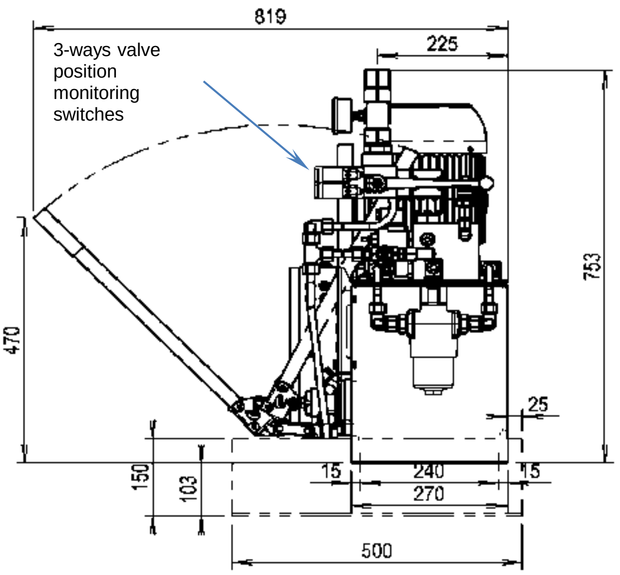
ATV 114 HYDRAULIC POWER PACK

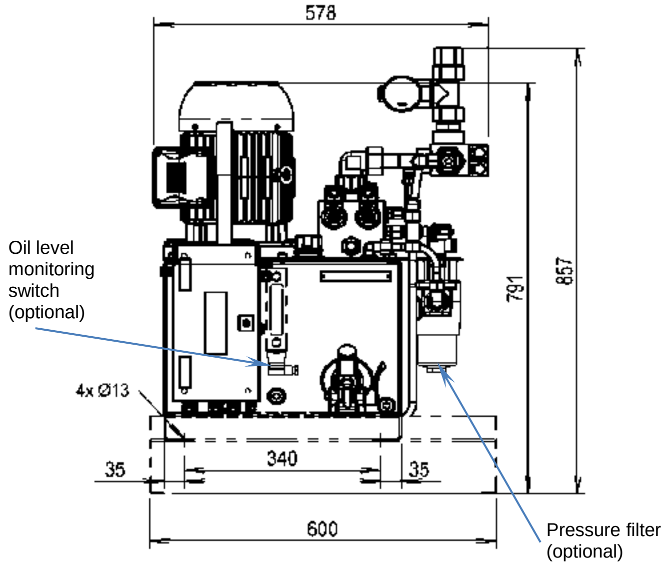


Hydraulic diagram



Data open to improvement





Drawing file Nr 12666

Technical features:			optional
Max pressure:	*bar*	230	120
Pump flow rate:	*l/min*	4,6	11
Motor power:	*kW*	2,2	2,2
Tank capacity:	*litre*	30	
Oil charge:	*litre*	26	
Nominal voltage (threephase):	*Vac - Hz*	3x400 - 50	
Weight (empty tank without options):	*kg*	95	

Inludes an integrated controller
Pressure is supplied when electric supply is on.
Pump stops when pressure top threshold is reached.
Pressure is released when electric supply is switched off

Mounting: 4 screws M12 Class 8.8 (not supplied)

Working conditions:

Ambient temperature:	-20° / +40°C
Humidity:	< 90 %
Protection :	IP55
Mounting position:	Horizontal

Options:

- Manual pump with 3-ways valve and manometer
- 3-ways valve position monitoring switches
- Oil level contact switch
- Oil temperature monitoring switch
- Pressure filter 10µm
- Air conditioner filter
- Dripping tray
- Oil heater / Oil circulation
- Solenoid valve monitoring switches

Other options and 3D models available on request
Instruction hanbook Nr. 272

atv Brakes

appareils de transformation de vitesse

BRAKE MONITORING DEVICES

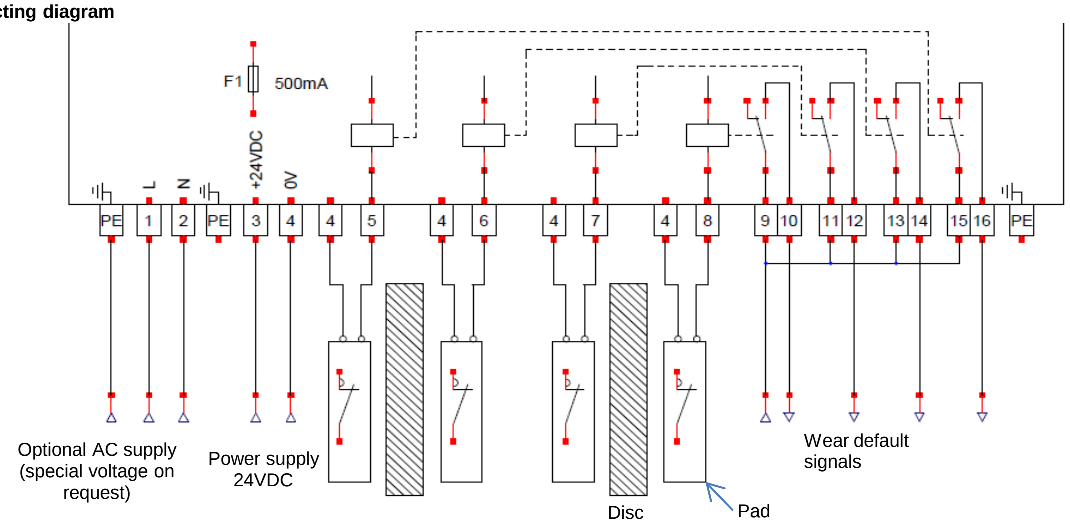
F3

CIUG

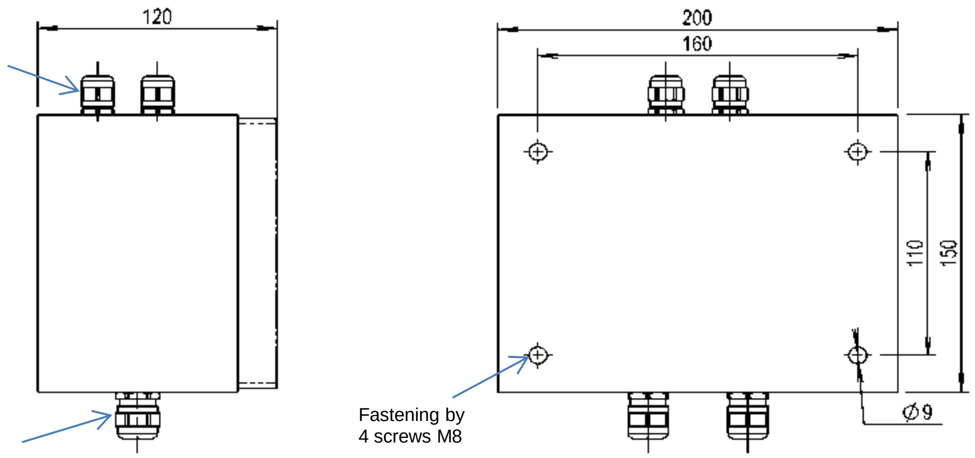
PAD WEAR MONITORING CONTROLLER

This device acts like a normally closed switch. It will open the electric contact as soon as one pad is worn out.
This system must be continuously powered.
The mornitoring function requires pads with wear monitoring wire.
4 pads can be connected.

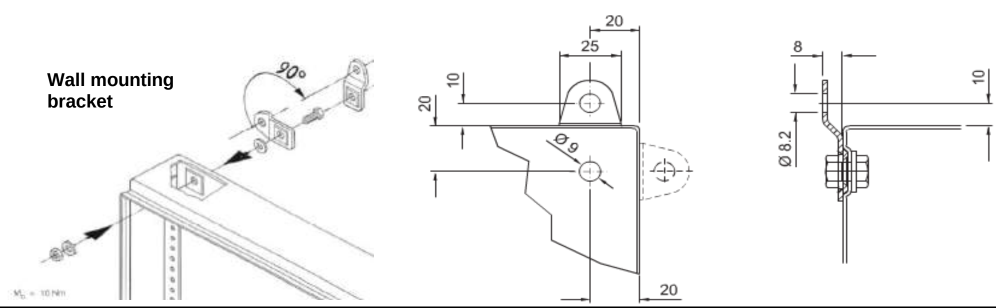
Connecting diagram



Cabinet dimensions



Wall mounting bracket



Drawing file Nr 12063

Data open to improvement

Technical features :

Supply voltage:	*VDC*	24
Power:	*W*	12
Integrated fuse:	*mA*	500
Cabinet material:		Sheet steel
Mounting bracket material:		zinc-plated steel
Distance from wall:	*mm*	8
Type of terminal:		with screws
Weight :	*kg*	2,2

Working conditions:

Ambient temperature:	-10°/+55°C
Humidity:	< 90 %
Protection:	IP66

Options :

- Special voltages (48VAC ; 230VAC ; 400VAC)
- Wall mounting brackets
- Stainless steel cabinet

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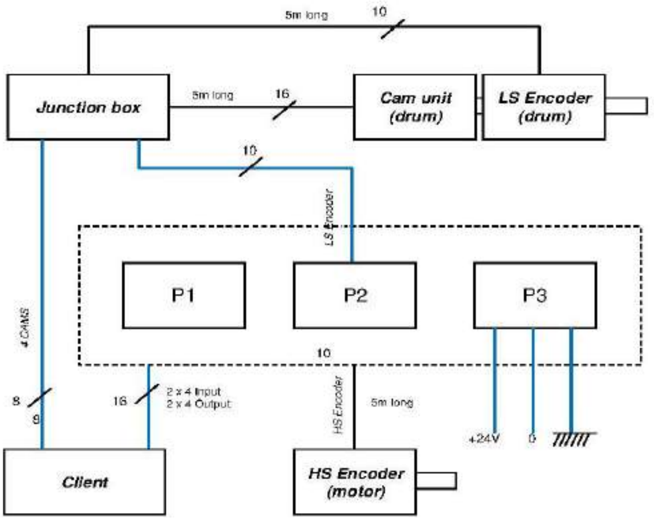
ATVSUR

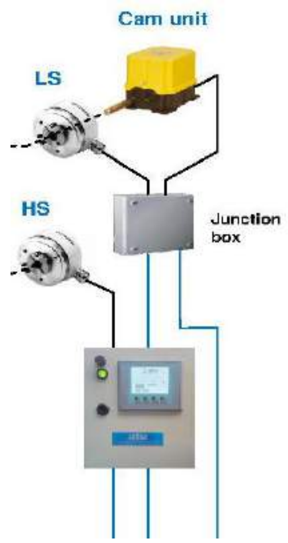
SPEED MONITORING MODULE

This speed monitoring device intended for hoisting systems, detects overspeed, load sliding in static mode, counter-rotation in dynamic mode, drive line breakage and unsynchronised rotation speeds (optional).
ATVSUR is permanently auto-controlled to ensure total safety.

Connection diagram

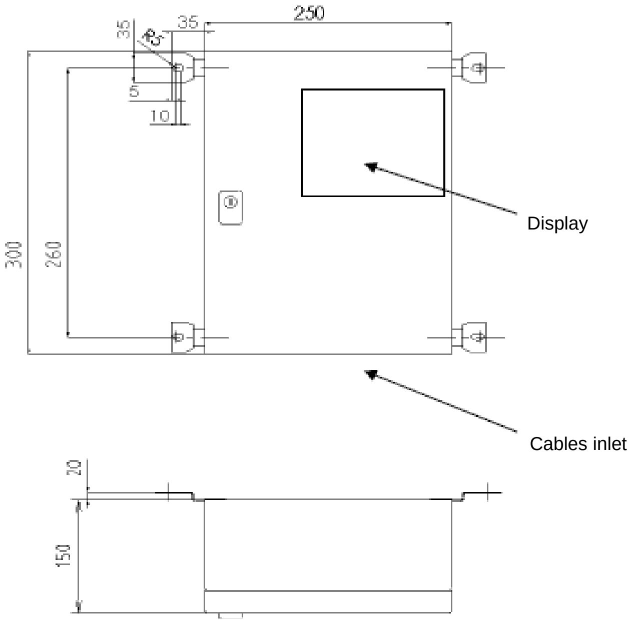


HS encoder	LS encoder
+ 24 V	+ 24 V
0 V	0 V
A	A
B	B
A/	
B/	

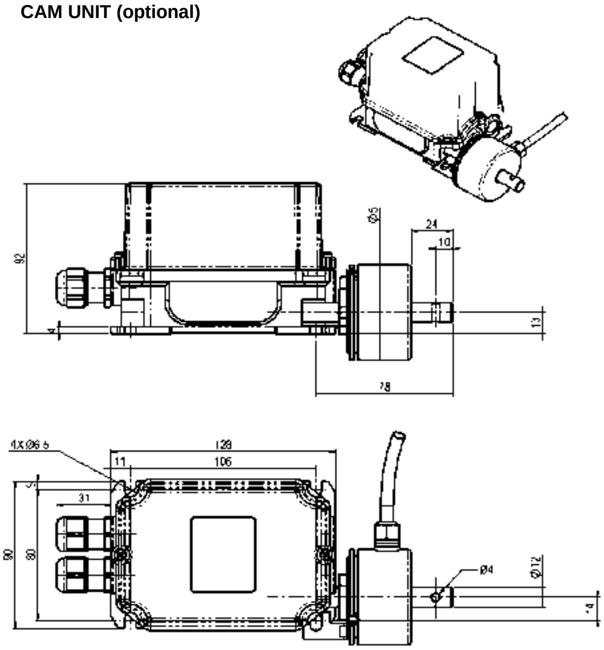


Dimensions and data open to improvement

ATVSUR (fixation with 4 screws M8)



CAM UNIT (optional)



Instruction handbook no 230

Technical features:
24 Vdc - 4 A supply
1024 pulses / revolution incremental encoders
300 x 250 x 150 mm steel controller box
180 x 167 x 107 mm steel junction box

Cam unit (optional):
Limit switch with shaft-mounted LS incremental encoder
From 2 thru. 5 cams available
LS Encoder driven by LS shaft
Cams driven by a gearbox with speed reducing ratio from 1:7,5 thru 1:550 (others upon request)

Working conditions:

Ambient temperature:	-10°/+55°C
Humidity:	< 90 %
Ingress protection:	IP55

Options:
- Cam unit
- Unsynchronised rotation speed alarm
- Positionning through absolute encoder
- Specific supply voltage

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GERMANY	KRANBAU KÖTHEN - STALVOSS - NOELL - KRAFOTEC - BRUNNHUBER - DEMAG CRANES - UTRANS - HELFER KRANSERVICE
ITALY	ANSALDO - DEMAG - ITALIMPIANTI - TECHINT - BONFANTI - OMIS SIDER PIOMBINO - ALMICI - MELONI - TENOVA - ITALGRU
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RENEWABLE ENERGIES

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NETHERLANDS	TOCARDO
GERMANY	ENERCON

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GERMANY	HAMBURG - BREMEN - MAINZ
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ALGERIA	ALGER - SKIKDA - ANNABA
TURKEY	ISTANBUL

SPECIAL MACHINES

FRANCE	POURTIER - FIVES STEIN - FIVES CAIL BABCOCK - CEGELEC - SIEMENS VAI - SETIC MILTEC - BAUDIN CHATEAUNEUF - SAPELEM - BROCHOT - MARCEAU AMALRIC - CNRS - GED - ADREM - AREVA - VINCI
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GREECE	GEFYRA
ITALY	TENOVA

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MARINE - OFF SHORE

FRANCE	NFM - COMEX - FLEXI-FRANCE - KLEY FRANCE - REEL IMECA
ITALY	SAIPEM - REMACUT - REMA ENGINEERING - FINCANTIERI
NETHERLANDS	ERS - HUISMAN
GERMANY	BLOHM & VOSS - LÜRSSEN WERFT - MASCHINENFABRIK BRÖHL

STEELWORKS

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ITALY	DALMINE – ILVA – AST –ARCELORMITTAL PIOMBINO – DANIELI – RIVA TARANTO – ITALSIDER
GERMANY	ARCELORMITTAL BREMEN - SAARSTAHL - ARCELORMITTAL HAMBURG - SALZGITTER FLACHSTAHL - BES RIVA STAHL - LECH STAHLWERKE - ELEKTROWERK WEISWEILER
SWEDEN	AVESTA – SSAB - SANDVIKEN - OUTUKUMPU
NETHERLANDS	TATASTEEL IJMUIDEN
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ROPEWAYS

FRANCE	POMAGALSKI - GIMAR MONTAZ MAUTINO - SEIREL - LST ROPEWAY
ITALY	LEITNER - GRAFFER - GARAVENTA - DOPPELMAYR

DEFENCE INDUSTRY

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MISCELLANEOUS

FRANCE	RENAULT – PSA – MICHELIN – FCB – AREVA – PLACOPLATRE – DMS – CALCIA – COFELY ENDEL – CREUZET AERONAUTIQUE – SOMAB – GOODYEAR DUNLOP

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