



Light trailer braking.
Report on testing in New Zealand to demonstrate equivalence
to UN/ECE Reg. 13



Report TEL 05027 – NZB

Trailquip Hy-go2 hydraulic coupling/drum brakes

Prepared By;
Tohora Enterprises Ltd

Date: 14/02/20

Table of Contents

Brief

Reference documents

Glossary

Meeting the requirements of R13

Test Procedure

Test Report

Conclusion

Supporting Information

Appendix 1 – Test results

Appendix 2 – Photos

**Appendix 3 – Trailquip Trailparts Hy-Go supply process for conformity of production &
Notice of Conformity**

Appendix 4 – Extracts from UN/ECE Regulation 13

**Appendix 5 – Trailequip Patriot Hygo 3.5T Drum Brake System GA, Component drawings &
Parts lists**

Brief

Tohora Enterprises was commissioned to carry out physical testing of the Trailparts Hy-go2 overrun braking systems fitted to a Class TB (2) trailer (2500kg-3500kg GVM), with Trailparts 10" (254x57mm) drum brakes connected to a Trailparts Hy-go2 hydraulic overrun coupling to the NZTA accepted test procedure and document the outcome to provide assurance that locally sourced braking systems meet the performance and technical requirements of the light trailer braking requirements in UN/ECE Reg 13 and therefore qualify for an exemption from clause 2.4(3) of the LTR Light-vehicle Brakes.

Reference Documents

Relevant NZ Land Transport Rules:

Land Transport Rule: Light-vehicle Brakes 2002

Other Relevant NZ Transport Agency Documents;

NZTA In Service Certification Vehicle Inspection Requirements Manual (VIRM)

Other relevant documents

UN/ECE Regulation 13

Light trailer braking requirements. Testing in New Zealand to demonstrate equivalence to UN/ECE Reg. 13 (Tohora Enterprises Ltd)

Glossary

g	Rate of change of velocity due to gravity (taken as 10m/s ²)
G _A	Manufacturer's maximum trailer mass capable of being braked by the control device
GVM	Gross Vehicle Mass (maximum laden weight of vehicle)
Laden;	Means loaded to the maximum GVM allowed by the manufacturer
LTR;	Land Transport Rules
The Agency	The NZ Transport Agency
R13	UN/ECE Regulation 13: Uniform provisions concerning the approval of vehicle of categories M, N & O with regard to braking
VIN;	Vehicle Identification Number
∅ ;	Diameter

Meeting the Requirements of R13

UN/ECE Regulation 13 is the common European standard for braking system for road vehicles from heavy trucks to light trailers first published in 1971 with regular amendments and revisions. While R13 covers all vehicle types of classes M, N & O, the interest here is in vehicles of Category O₂; Trailers with a maximum weight exceeding 0.75 metric ton but not exceeding 3.5 metric tons. The relevant sections of R13 are;

Annex 4: Braking tests and performance of braking systems

Annex 12; Conditions governing the testing of vehicles equipped with inertia (overrun) braking systems

This testing was designed and has been carried out to meet the requirements for Category O₂ trailers outlined in Annex 12 and carried out in accordance with Annex 4

Prior to physical testing of the braking system all component parts of the inertia braking system, namely the control device (Coupling head and attendant components), the transmission (method of transmitting the signal from the control device) and the wheel brakes (brakes), were confirmed to meet the requirements defined in Annex 12.

The control device has been designed in such a way as to ensure that;

- the trailer can be operated in reverse when being towed without placing undue drag on the system not greater than $0.08g \times G_A$,
- operates automatically when reversing takes place, disengages automatically when the trailer moves forward and does not adversely affect the parking performance of the brake when parked facing up a gradient.
- The control device demonstrates conformity with the performance requirements of paragraphs 3 & 4 of Annex 12 as detailed in paragraph 5.

The brakes also meet the performance requirements of Annex 12 and can demonstrate conformity with the requirements of paragraph 6.1 of Annex 12.

Test Procedure

Testing of the Trailparts Patriot Hy-go class TB2 'overrun' type hydraulic brake system was carried out on Tuesday 28th and Wednesday 29th January 2020 using a Ford Ranger ute to tow the test trailer, a two axle simple trailer on 195R14 tyres (675mm Ø) with drop axles with both axles fitted with Trailparts 254 x 57mm CI drums and Trailparts 10" hydraulically operated uni-servo brakes and a Trailparts Hy-go2 3500kg overrun couplings designed for hydraulic brake systems with a breakaway system that fully applies the park brake once activated. A cable operated mechanical park brake was fitted to both axles on the trailer.

Test Conditions

Testing was carried out with the subject trailers in the fully laden condition

All on road tests were carried out on a NZ standard dry level sealed road with no loose gravel

The test trailers were both permanently marked with individual Vehicle Identification Numbers (VIN).[fig1]

The test trailers were tested at a certified weight for each test

All testing was conducted on a fine dry day with minimal wind with the same environmental and physical conditions.

On road testing brake applications were from 30kph on a marked section of road to allow confirmation of deceleration.

Each test was carried out a minimum of three times.

No mechanical or brake repairs were required to any vehicle during the tests

All vehicles were able to be legally operated on the road throughout the test(s)

Deceleration is expressed in 'g'

The laden and park brake tests for each trailer were also carried out using alternative, smaller, wheel/tyre combinations (195/50R13C) that has a diameter of 525mm. These tests have also been tabulated.

While UN/ECE R13 allows light trailer components to be tested and approved as a single axle set we used two axle trailers with all axles braked as the range of interest for this testing was 2500kg to 3500kg (Class TB2). However, as there is no requirement for a forward distance to be measured the test only required a tow vehicle towing a trailer to be tested in the following combination;

1. Tow vehicle with a twin axle simple trailer (drum brakes).
2. Tow vehicle loaded so that the tow vehicle to trailer weight ratio is no more than 1:1.5
3. Tow vehicle in the same condition of loading for all tests

To negate the effect of the brakes of the towing vehicle and ensure that the trailer brakes are doing the work the following initial procedure was carried out using the tow vehicle on its own in its state of loading as used throughout the rest of the testing to set a benchmark;

The tow vehicle was tested in that state of loading using the same test venue under the same conditions as the later combination tests. The results for this test are tabulated and were averaged to determine the baseline.

As subsequent tests for the combination are within 5% of the result for the tow vehicle alone it demonstrates that the trailer braking had negligible effect on the deceleration of the towing vehicle so,

conversely, braking effort of the towing vehicle also had negligible effect on the braking effort of the trailers.

[if the combination stopped quicker than the tow vehicle alone then the trailer would have added significantly to the braking effort of the combination while, if the combination did not stop as well as the tow vehicle alone then the trailer would not have contributed its share to the braking effort.]

Prior to testing the following information was collated and rechecked at the conclusion of testing

ITEM	Before	After	CRITERIA
(a) Brake drum cylindrical section (b) Brake drum/disc material (c) Brake drum/disc mass	Cast steel Cast steel	No change No change	No Change allowed No Change allowed May increase up to + 20 per cent from the reference drum or disc mass
(a) Proximity of wheel to outside surface of brake drum or outside diameter of brake disc (b) Part of brake drum or brake disc not covered by wheel	Within Tolerance N/A	No Change N/A	To remain within manufacturers stated tolerances
(a) Brake lining or brake pad material (b) Brake lining or brake pad width (c) Brake lining or brake pad thickness (d) Brake lining or brake pad actual surface area (e) Brake lining or brake pad method of attachment	) ) ) ) within spec ) )	) ) ) ) No change ) )	) ) ) )No change allowed))
Brake geometry	Std	No Change	No change allowed
Tyre rolling radius (R)	338mm (263 Alt Tyre)	Inflation pressure maintained	May change subject to the tyre manufacturer's specifications. No inflation/deflation allowed
(a) Actuation thrust (ThA) (b) Actuation stroke (s) (c) Actuation lever length (l) (d) Actuation pressure (p)			May change provided that the predicted performance parameters are met
Static mass (P)	3260kg (Drum)	3260kg (Drum)	Static mass (P) shall not alter

Test Report

All vehicles were tested in a road-legal condition with current Warrants of Fitness (in the case of the trailers, gained withing seven days of the testing being carried out).

The test was carried out in the following sequence for greatest efficiency;

1. On road stopping tests for the towing vehicle (fig 2)
2. On road laden stopping tests for the #2 combination, (trailer drum Brakes, Drop axles, Std wheels/tyres) [from 30kph within 7m]
3. On road laden fade test #2 combination, std wheels/tyres. This test was accomplished by towing the laden trailer for 1700m @ 40kph with the brake adjusted so that there was a braking force equivalent to 7% of the maximum stationary axle load applied to each braked axle of the trailer (60-65kN/wheel). This load was achieved by adjusting the mechanical park brake and using a strain gauge between the towing vehicle and the trailer to achieve a loading of 300Kg (250Kg + 50Kg rolling resistance).

4. Fade verification test #2 combination [from 30kph withing 7m]. This test was carried immediately after the fade test described above but with the preload removed.
5. On road laden stopping tests for the #2 combination, alternative wheels/tyres
6. On road laden fade test #2 combination, alternative wheels/tyres. Process as (3) above.
7. Fade verification test #2 combination [from 30kph within 7m]. Process as (4) above

Further tests were carried out at the workshop on a flat, even concrete pad.

8. The auto reverse lockout was demonstrated by engaging reverse gear and backing the trailer in combination
9. The breakaway function was demonstrated by disconnecting the trailer from the coupling and driving forward with a frangible link between the tow vehicle and the park brake lever. Once the link had activated the trailer park brake system full park braking was applied to all four wheels. (fig 4)
10. Park brake test laden #2 trailer with standard wheel/tyre combination (drag test forward). With the trailer stationary the park brake was applied and a strain gauge was fitted between the trailer and the towing vehicle and the towing vehicle driven off. The trailer had to withstand a pull of at least 700Kg (the load calculated to keep the fully laden trailer stationary on a 20% slope) without the wheels showing signs of rotating. (fig 5 & 6)
11. Park brake test laden #2 trailer with standard wheel/tyre combination (drag test backwards). The same test as above with the trailer being pulled backwards (fig 7)
12. Park brake test laden #2 combination with alternative wheel/tyre combination (drag test forward). Same as previous forward test.
13. Park brake test laden #2 combination with alternative wheel/tyre combination (drag test backwards). The same test as above with the trailer being pulled backwards

Test results were as recorded on the attached results sheet.

Observations

The drum braked trailer demonstrated consistent and repeatable braking with no anomalous readings that were not caused by driver error (missing the braking marker). (fig 8 & 9)

There was no discernible fade throughout the testing

Once the fade test had been completed the hot performance of the brakes was verified using the same three stop procedure as for the cold brake tests. An improved brake performance was achieved for the hot brake test over the previously completed cold brake tests.

The breakaway system is designed in such a way that the integrity of the trailer braking system is maintained as long as the trailer is connected to the towing vehicle but is activated immediately the trailer detaches from the towing vehicle. This is achieved by the breakaway cable pulling a lever that activates the park brake system.

Conclusion

Given the results of the testing it is reasonable to conclude that the Trailparts Hy-go2 drum braked overrun braking systems for class TB2 trailers (2500kg -3500kg) meet the performance and technical requirements of UN/ECE Regulation 13 with regard to Category O₂ vehicles; Trailers with a maximum weight exceeding 0.75 metric ton but not exceeding 3.5 metric tons and should therefore be given access to exemptions from Land Transport Rule: Light-vehicle Brakes 2002 [Rule 32014] to enable direct competition with the substantially similar European systems currently being imported without restriction.

Given that the braking for the drum braked trailer using both the standard wheel/tyre combination [14" wheels with 95R14 tyres (675mm Ø)] and the smallest alternative wheel/tyre combination [13" wheel with 195/50R13C tyres (525mm Ø)] meet the requirements of UN/ECE R13 for both service and park brakes then it can be accepted that wheel/tyre combinations between these two diameters will also meet the requirements and can be used.

Further Action

Once the Agency has accepted that the braking systems tested to this procedure are equivalent to the performance and technical requirements in R13 for Class TB(2) trailers (European Category O₂) any trailer manufacturer using the braking system must apply for an exemption from the Standard compliance requirements in clause 2.4(3) of the Rule.

To facilitate this, as the brake system supplier, Trailquip will supply a pre-prepared *Application for an exemption from land transport vehicle rules* (form VCUEF11) to the trailer manufacturer who is required to complete the application by adding the VIN/Serial number(s) of the trailer(s) that will be covered by the proposed exemption and pay the appropriate fee.

Note that the Agency, when considering any exemption application, may decline the application or impose whatever conditions it sees as appropriate. The Agency may also limit the number of vehicles that can be considered in any one application.

Supporting Information

Information provided to support this report and its conclusion include;

1. Tabulated test results
2. Illustrative photos
3. A diagram of the assembled braking equipment showing its relative position of the components on the vehicle. This covers all vehicle configurations considered and include the breakaway and park brake systems.
4. Detailed drawings of each component to enable easy location and identification. A list of components, identified by part number is included on the drawing(s)
5. Evidence that a system is in place to ensure Conformity of Production
6. Relevant extracts from UN/ECE Reg 13

Appendix 1

Light trailer brake testing compatible with UN/ECE Reg 13.

Record of testing of the Trailquip Trailparts Hy-go overrun braking system for Class TB2 trailers to demonstrate the system compatibility with UN/ECE Reg 13 braking requirements for Category O₂ trailers.

Tow Vehicle; Make/Model; 2013 Ford Ranger, Test weight 2980Kg, Registration No; LTL976
Trailer #2 Make/Model; Trailquip 3.5x2 SB, Tare 780Kg, test weight 3260Kg, Registration No, 51U34

Record of on road combination laden stopping tests (overall results)

To demonstrate repeatability a minimum of three successful tests have been completed.

Test conditions; Flat, dry, sealed space without wind assistance (no greater than 5kph). Brake system burnished, cold.

Procedure 1 - Stopping test of towing vehicle

Test	Criteria	Stopping Distance	= Decel (g)	Result	Comment 195R14 tyres (675mm Ø)
Test 1	.5g/7m	6.1 m	0.64	Pass	
Test 2	.5g/7m	5.3m	0.75	Pass	
Test 3	.5g/7m	5.7m	0.70	Pass	
Test 4	.5g/7m	4.8m	0.81	Pass	Average 0.73g

Procedure 2 -Test of the #2 combination with the trailer laden

Laden	Criteria	Stopping Distance	= Decel (g)	Result	Comment 195/R14 tyres (675mm Ø)
Test 1	.5g/7m	5.3	0.75	Pass	
Test 2	.5g/7m	5.0	0.79	Pass	
Test 3	.5g/7m	5.6	0.71	Pass	
Test 4	.5g/7m	5.4	0.74	Pass	Average 0.75 (within ± 5% of Procedure 1 baseline)

Procedure 3 - Fade test (hot performance) #2 combination

Speed	Distance	Drawbar load required	Drawbar load actual	Comment 195R14 tyres (675mm Ø)
40kph	1700m	290Kg	302Kg	

Procedure 4 - Test of the #2 combination with the trailer laden after fade test

Laden	Criteria	Stopping distance	= Decel (g)	Result	Comment 195R14 tyres (675mm Ø)
Test 1	.5g/7m	4.5	0.82	Pass	
Test 2	.5g/7m	5.1	0.78	Pass	
Test 3	.5g/7m	5.2	0.76	Pass	Average 0.79 - hot performance improved

Procedure 5 -Test of the #2 combination with the trailer laden (alternative wheels/tyres)

Laden	Criteria	Stopping Distance	= Decel (g)	Result	Comment 195/50R13C tyres (525mm Ø)
Test 1	.5g/7m	4.5	0.86	Pass	
Test 2	.5g/7m	5.1	0.78	Pass	
Test 3	.5g/7m	5.6	0.70	Pass	
Test 4	.5g/7m	5.2	0.76	Pass	Average 0.77 (within ± 5% of Procedure 1 baseline)

Procedure 6 - Fade test (hot performance) #2 combination (alternative wheels/tyres)

Speed	Distance	Drawbar load required	Drawbar load actual	Comment
40kph	1700m	290Kg	304Kg	195/50R13C tyres (525mm Ø)

Procedure 7 - Test of the #2 combination with the trailer laden after fade test (alternative wheels/tyres)

Laden	Criteria	Stopping distance	= Decel (g)	Result	Comment
					195/50R13C tyres (525mm Ø)
Test 1	.5g/7m	4.2	0.91	Pass	
Test 2	.5g/7m	4.5	0.87	Pass	
Test 3	.5g/7m	5.7	0.70	Pass	Average 0.83 - hot performance improved

Record of tests carried out at the workshop

Procedure 8 - The auto reverse lockout was successfully demonstrated by engaging reverse gear and backing the trailer in combination

Procedure 9 - Breakaway brake - The breakaway brake was demonstrated by pulling the breakaway wire showing 100% activation of the park brake. This was demonstrated both statically and dynamically, demonstrated by disconnecting the trailer from the coupling and driving forward with a frangible link between the tow vehicle and the park brake lever. Once the link had activated the trailer brake through the coupling full park braking was applied to all four wheels. (fig 4).

% of stationary wheel load	Comment
100%	Breakaway brake fully activated the park brake

Procedure 10 - Park brake test laden #2 trailer with standard wheel/tyre combination (drag test forward).

With the trailer stationary the park brake was applied and a strain gauge was fitted between the trailer and the towing vehicle and the towing vehicle driven off. The trailer had to withstand a pull of at least 700Kg (the load calculated to keep the fully laden trailer stationary on a 20% slope) without the wheels showing signs of rotating. (fig 5 & 6)

load required without wheel rotation 700Kg	Comment
Minimum achieved 1368Kg	No wheel rotation observed

Procedure 11; Backwards laden park brake test #2 trailer with standard wheel/tyre combination (drag test backwards). The same test as above with the trailer being pulled backwards (fig 7)

load required without wheel rotation 700Kg	Comment
Minimum achieved 860Kg	No wheel rotation observed

Procedure 12; Laden park brake test #2 combination with alternate wheel/tyre combination (drag test backwards). The same test as Procedure 10

load required without wheel rotation 700Kg	Comment
Minimum achieved 928Kg	No wheel rotation observed

Procedure 13; Backwards laden park brake test #2 combination with alternate wheel/tyre combination (drag test backwards). The same test as procedure 11

load required without wheel rotation 700Kg	Comment
Minimum achieved 860Kg	No wheel rotation observed

These tests supervised, witnessed and verified by NZTA appointed HV Specialist Certifier with the Brakes category (HVEK) on 28th & 29th January 2020 at Dargaville.

Name_ **Stephen Arthur Bullôt**

Signed



Certifier ID

SAB

Tohora Enterprises Ltd
Tohora.ent@gmail.com
021 02267176

Appendix 2
Illustrative photos



Fig 1; VIN for trailer registration Number 51U34



Fig 2; Brake testing tow vehicle Day 1



Fig 3; On-road stopping test Comb #2 alt wheels



Fig 4; Breakaway system activation lever



Fig 5; Park brake test 1



Fig 6; Park brake test 2



Fig 7; Backwards park brake test



Fig 8: stopping distance (4.5m)



Fig 9; stopping distance (5.3m)

Appendix 3
Trailquip Hy-Go Conformity of Production Policy and Procedure

The Hy-go system is a series of components, that when used together in the configuration as specified in the following pages, complies with or exceeds the performance requirements of ECE Regulation 13, specifically for O-class trailers fitted with hydraulic brakes. Important to note is that the performance and critical functions are being tested as a system, not of individual components being certified individually. Conformity of Production is a process that ensures that the components being tested and certified initially are consistent with the products being released to the market as time goes on.

The braking system tested and documented is being considered in two parts;

Category A: the primary braking system – the braking components working together that carry the critical safety function of safely slowing a trailer on road.

Category B: other components that are an important part of the trailer and it’s brake system, but don’t perform the critical primary braking functions. See Page 2.

Category A items only are proposed for CoP processes.

Category A Elements: Primary Braking System			CoP Processes		
Component	Description	Part number/s	Doc1	Doc2	Traceability
1	Hygo Brake Actuator Assembly	C2000M-C27	Drawings	QC and spec checks against design drawings.	Serial No. matched to trailer VIN
2	Trailparts Hy-go mechanical-hydraulic conversion kit	CHY01	Drawings	QC and spec checks against design drawings.	Serial No. matched to trailer VIN
3	Trailparts 1750kg axle assembly fitted with 10” x 2” Drum Brakesr		Drawings	QC and spec checks against design drawings	1. Axle serial number logged against trailer VIN. 2. Batch numbered components registered against axle serial #.

Category B

Components from category B are already commonly fitted in the light trailer marketplace and do not alter the primary braking performance; therefore they do not require CoP processes for ongoing supply. Approved alternatives as noted in the following can be used as desired for category B components.

Category B Elements: Other Components					
Component	Description	Part number	Parent Part	Variation allowed	Approved variation
4	1750kg stub axle with caliper mount	A5949	N/A	No	N/A
5 6 7	Axle nut, pin and washer set	Nut: A5970NUT Pin: A5970PIN Washer: A5970WAS	A5949	No	N/A
8 9 10 11 12	1750kg bearing and seal kit	Outer bearing cup: H12710 Outer bearing cone: H12749 Inner bearing cone: H68110 Inner bearing cone: H68149 Seal: H4891	H4602H	No	N/A
13	Wheelstuds 0.5"UNF x 38mm	H4982	H4602H	Yes	Length and thread variations to match wheels and wheelnuts being used
14	Wheelnuts 0.5"UNF	H4996	H4602H	Yes	Thread and taper variations to match wheels and wheelstuds being used
15	45mm grease cap	H4951	H4602H	Yes	Any 45mm grease cap OK
16	Mechanical brake actuation cables	N/A	N/A	Yes	Any suitable steel or synthetic cables OK. Rods of suitable diameter OK.
17	Mechanical brake cable adjuster	B3121	C2827	Yes	Any cable adjuster with pulley OK.
18	Hydraulic lines	N/A	N/A	Yes	Design can be altered to requirements of the trailer. Brakelines and hoses used must comply with SAE J1401 or equivalent standard.
19	Tyres 195mm wide	Various	N/A	Yes	Any tyre of 195mm width OK, provided it is between 525mm and 675mm diameter.

Annex 12

Conditions governing the testing of vehicles equipped with inertia (overrun) braking systems

1. General provisions

1.1. The inertia (overrun) braking system of a trailer comprises the control device, the transmission and the wheel brakes, hereinafter called "brakes".

1.2. The control device is the aggregate of the components integral with the traction device (coupling head).

1.3. The transmission is the aggregate of the components comprised between the last part of the coupling head and the first part of the brake.

1.4. The "*brake*" is the part in which the forces opposing the movement of the vehicle develop. The first part of the brake is either the lever actuating the brake cam or similar components (mechanical-transmission inertia braking system), or the brake cylinder (hydraulic-transmission inertia braking system).

1.5. Braking systems in which accumulated energy (e.g. electric, pneumatic or hydraulic energy) is transmitted to the trailer by the towing vehicle and is controlled only by the thrust on the coupling do not constitute inertia braking systems within the meaning of this Regulation.

1.6. Tests

1.6.1. Determination of essential components of the brake.

1.6.2. Determination of essential components of the control device and verification of the latter's conformity with the provisions of this Regulation.

1.6.3. Checking on the vehicle:

(a) The compatibility of the control device and the brake; and

(b) The transmission.

Appendix 4

Relevant extracts from UN/ECE Regulation 13

UN/EC R13; Annex 4

1.5. Type-I test (fade test)

1.5.2.

With continuous braking

1.5.2.1.

The service brakes of trailers of categories O2 and O3 must be tested in such a manner that, the vehicle being laden, the energy input to the brakes is equivalent to that recorded in the same period of time with a laden vehicle driven at a steady speed of 40 km/h on a 7 per cent down-gradient for a distance of 1.7 km.

1.5.2.2.

The test may be carried out on a level road, the trailer being drawn by a towing vehicle: during the test, the force applied to the control must be adjusted so as to keep the resistance of the trailer constant (7 per cent of the maximum total stationary axle load of the trailer). If the power available for hauling is insufficient, the test can be conducted at a lower speed but over a greater distance as shown in the table below:

Speed (km/h)	Distance (metres)
40	1700
30	1950
20	2500
15	3100

1.5.2.3.

In the case of trailers equipped with automatic brake adjustment devices the adjustment of the brakes shall, prior to the Type-I test prescribed above, be set according to the procedure as laid down in paragraph 1.7.1.1. of this annex.

1.5.3

Hot performance

1.5.3.1.4.

However, in the case of trailers, the hot brake force at the periphery of the wheels, when tested at 40 km/h, must not be less than 36 per cent of the maximum stationary wheel load, nor less than 60 per cent of the figure recorded in the Type-0 test at the same speed.

3. PERFORMANCE OF BRAKING SYSTEMS OF VEHICLES OF CATEGORY O

3.1. Service braking system.

3.1.2.

Provisions relating to tests of vehicles of categories O2 and O3

3.1.2.1.

If the service braking system is of the continuous or semi-continuous type, the sum of the forces exerted on the periphery of the braked wheels shall be at least x per cent of the maximum stationary wheel load, x having the following values:

x [%]

full trailer and centre-axle (simple) trailer laden and unladen: 50

3.1.2.3.

If the braking system is of the inertia type, it must comply with the requirements of annex 12 to this Regulation.

3.1.2.4.

In addition, the vehicles must undergo the Type-I test

3.2. Parking braking system.

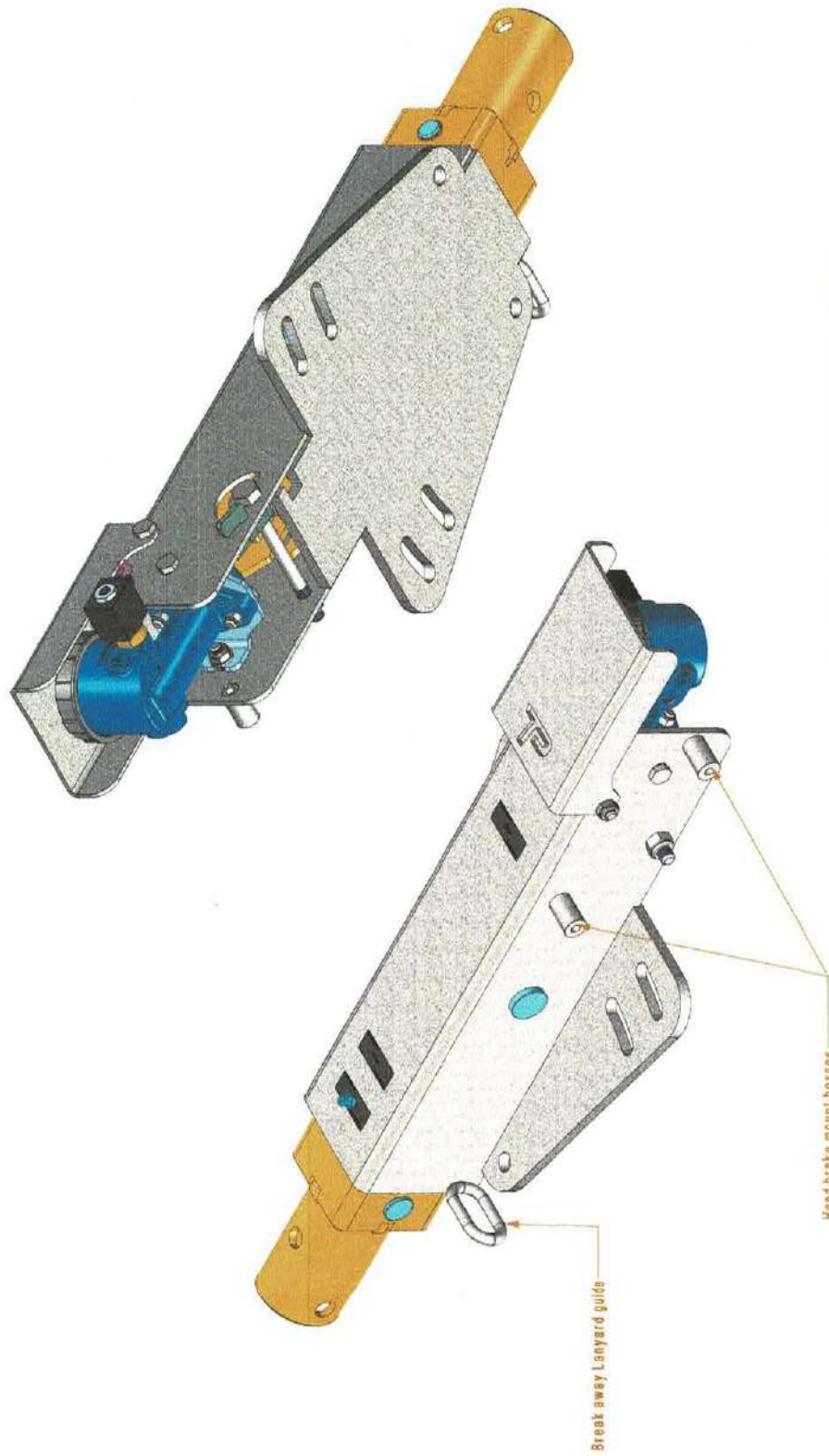
3.2.1. The parking braking system with which the trailer is equipped must be capable of holding the laden trailer stationary, when separated from the towing vehicle, on an 18 per cent up or down-gradient. The force applied to the control device must not exceed 60 daN.

3.3 Automatic braking system.

3.3.1.

The automatic braking performance in the event of a failure, as described in paragraph 5.2.1.18.3. of this Regulation, when testing the laden vehicle from a speed of 40 km/h, shall not be less than 13.5 per cent of the maximum stationary wheel load. Wheel-locking at performance levels above 13.5 per cent is permitted.

C2000 HYGO 2 Brake Actuator ASSY



Weld detail not shown in schematic drawings

Sheet Size	Sheet	A3(H) 1/3	
Drawing Name	Part #	C2000M_C27_ASSY_2D	C2000M_C27_ASSY
Qty/Parent	Qty/Parent	1	1
Material	Material		C2000M_C27_ASSY
Est. Weight	Est. Weight		Sample
Finish	Finish		HEQ
Min. Hardness	Min. Hardness		
Process	Process		Full
Rev.	Rev.		
Rev. Date	Rev. Date		2/18/2020

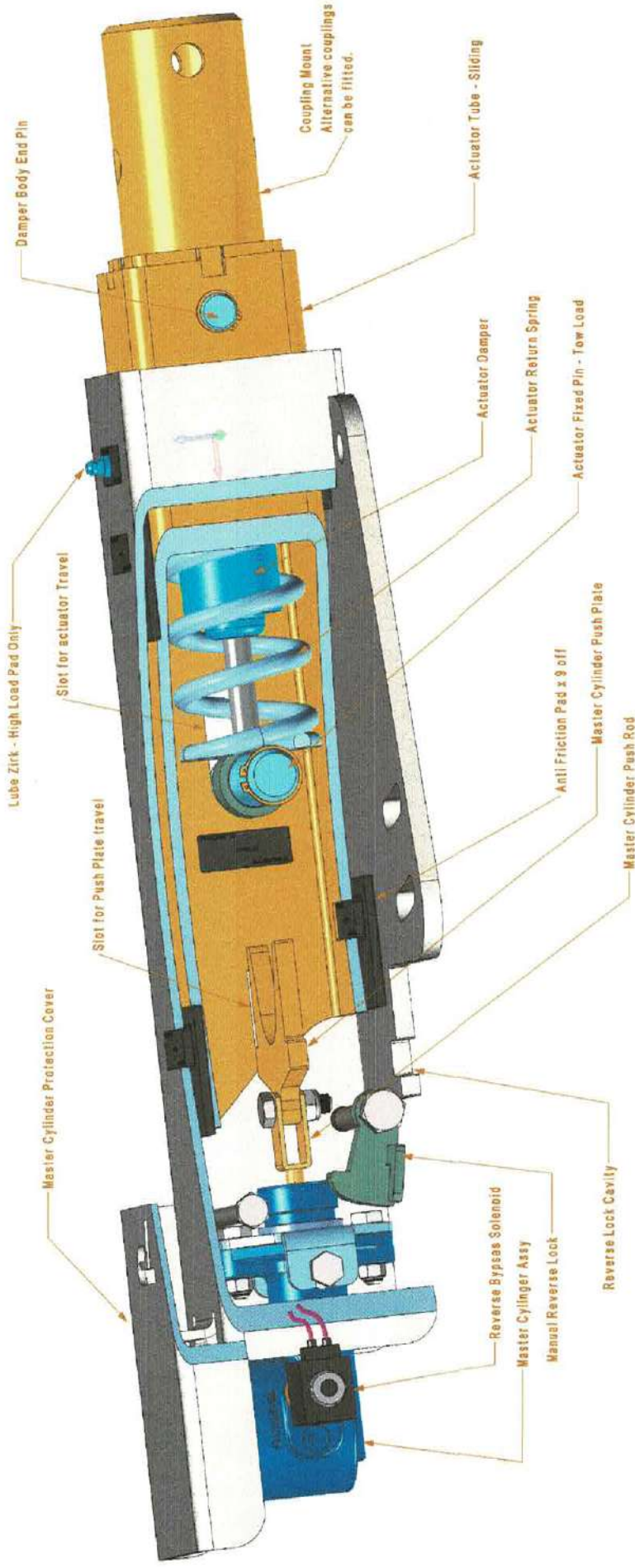
Projection	Parent Part	C2000
	Scale	1:3
	Coating	
	CLASS	
	Min. tensile	
	Min. Hardness	
	MatCode	

TRAILEQUIP
 6 Tuas Street
 New Zealand
 064 7 231 8600
 www.trailequip.co.nz

DO NOT SCALE DRAWING
 UNLESS OTHERWISE SPECIFIED:
 UNLESS OTHERWISE SPECIFIED:
 Surface finish - see
 as cast - and/or as indicated
 Machined - Break all edges

COPYRIGHT - DESIGN PROTECTION
 All information is property of the
 copyright owner and is not to be
 distributed or otherwise
 reproduced without the express
 permission of the copyright owner.
 Any breach resulting in reproduction
 will result in court action for damages.

C2000 HYGO 2 Actuator Cutaway



Activation of the master cylinder is direct but return of actuator and master cylinder piston is independent. Damper improves low speed and unload action, whilst reducing towbar transmitted noise between direction transitions.

Sheet	3/3
Drawing Name	C2000M_C27_ASSY_2D
Part /	C2000M_C27_ASSY
Old Model Name	C2000M_C27_ASSY
Rev.	...
Sheet Site	A3(H)
Rev. Date	...

8 Tulse Street, Burgess Hill, BN27 2JZ Tel: 01243 858808 www.trailequip.co.uk	TRAILEQUIP
DO NOT SCALE DIMENSIONS UNLESS OTHERWISE SPECIFIED: SCALE: AS SHOWN TOLERANCES: ±0.05 ±0.15 Surface finish - un less otherwise specified Material - as specified Heat treated - as specified	Copyright - DESIGN PROTECTION All information is proprietary to the originator and is not to be copied, reproduced or used in any way without the express permission of the originator. Any breach resulting in reproduction will result in court action for damages.
Part / Description C2000M/C27TUBE - Actuator ASSY Fill Component C2000	

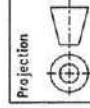
C2828HD Handbrake Assy.



Sheet Size Sheet
A3(H) 1/3

Drawing Name	C2828HD_ASSY_2D
Part #	C2828HD_ASSY
CAD Model Name	Sample
Document Status	Sample
Drawn by	PS
Approved by	TEG
Description	C2828 Heavy Duty Handbrake & adjuster Assy
...	...
File	Configuration
C2828_HD_Handbrake	Default
Rev. Date	27/05/2020
...	...

Qty/Parent	1
Material	...
Est. Weight	...
Finish	...
...	...
Min. Tensile	...
Min. Hardness	...
Process	Profile
Rev.	...
...	...
ResCode	G



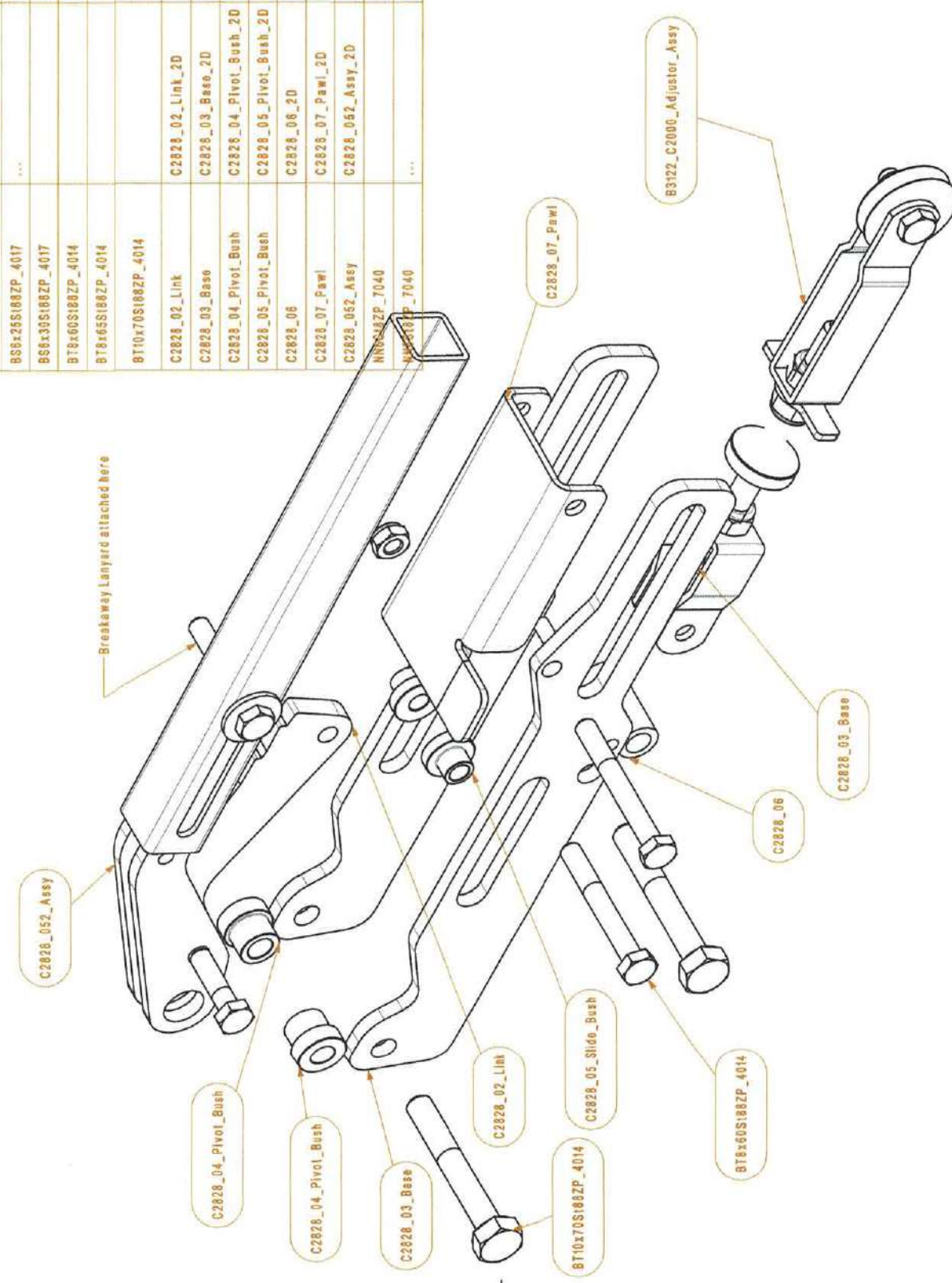
2 Tuna Street,
Dunsmuir 0372
+64 6 488 8809
www.trailequip.co.nz



DO NOT SCALE DIMENSIONS
UNLESS OTHERWISE SPECIFIED:
HOLE SIZE ±0.05 #57
Surface finish - in
Micro - finish based
on drawing - check for changes

COPYRIGHT - DESIGN PROTECTION
All information is proprietary to the
originator and is not to be copied,
reproduced, or used for any purpose
distributed except for the express purpose
of production for the owner and with his
written permission. Any unauthorized
reproduction in reproduction will
result in court action for damages.

1	2	3	4	5	6	7	8
A							
B							
C							
D							
E							
F							
G							
H							



Number	DWGName	Description	Qty
83122_C2000_Adjustor_Assy	DWGName	Cable brake tension adjuster & guide	1
858x25S188ZP_4017	...	M6 x 25 St Gr8.8 ZP ISO4017	1
858x30S188ZP_4017	...	Bolt M8 St ZP -ISO4017	1
878x60S188ZP_4014	...	M18 x 60 Bolt ZP 8.8 ISO4014	1
878x65S188ZP_4014	...	M18 x 65 Bolt ZP 8.8 ISO4014	1
8T10x70S188ZP_4014	...	M12x110 Gr8.8 ZP ISO 4014	2
C2828_02_Link	C2828_02_Link_2D	HB Link Lever	1
C2828_03_Base	C2828_03_Base_2D	HB Base Frame	2
C2828_04_Pivot_Bush	C2828_04_Pivot_Bush_2D	HB_Pivot/Slider Bush	2
C2828_05_Pivot_Bush	C2828_05_Pivot_Bush_2D	HB_Pivot/Slider Bush	2
C2828_06	C2828_06_2D	Base spacer tube	1
C2828_07_Pawl	C2828_07_Pawl_2D	Auto Locking Return Prevention Pawl	1
C2828_052_Assy	C2828_052_Assy_2D	HB Sliding Handle_ASSY	1
83122_C2000_Adjustor_Assy	...	Nyloc M6 St Gr8 ZP ISO 7040	1
83122_C2000_Adjustor_Assy	...	Nyloc St Gr8 ZP ISO 7040	3

Sheet	2/3
Drawing Name	C2828HD_ASSY_2D
Part Name	C2828HD_ASSY
Part No	C2828HD_ASSY
Configuration	011811
Rev.	...
Sheet Size	A3(N)
Rev. Date	...

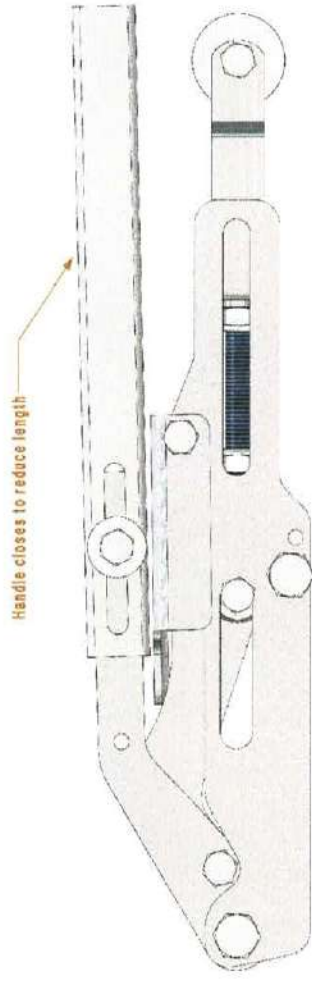
TRAILEQUIP
 2 Tuna Street
 Reynolds City, OR 97630
 503.252.8808
 www.trailequip.com

DO NOT SCALE DIMENSIONS
 UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN MILLIMETERS
 SURFACE FINISH - UNLESS OTHERWISE SPECIFIED:
 ALL DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED
 SURFACE FINISH - UNLESS OTHERWISE SPECIFIED:
 ALL DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED

TRAILEQUIP
 2 Tuna Street
 Reynolds City, OR 97630
 503.252.8808
 www.trailequip.com

Handbrake & Breakaway Activation

Handbrake OFF



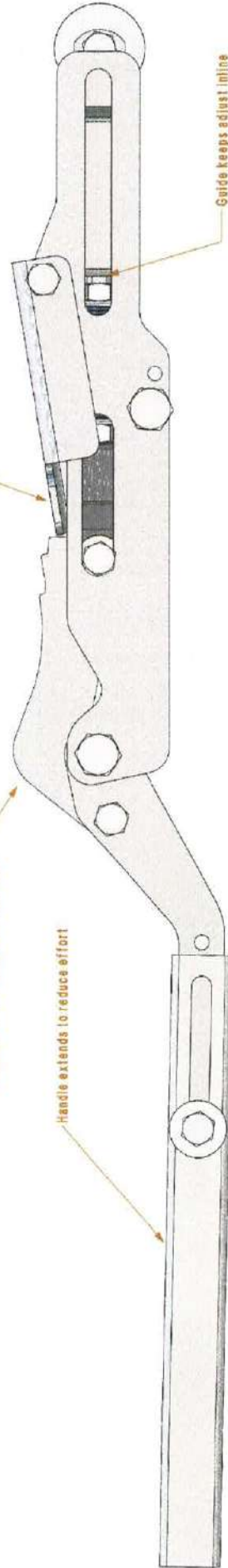
Hand brake over centres to self hold

Handle extends to reduce effort

Overcentre Pawl prevents accidental opening. During breakaway, three anti return positions are engaged progressively.

Guide keeps adjust inline

Handbrake ON



Sheet Size

Sheet A3(H) 3/3

Drawing Name	C2820HD_ASSY_2D
Part #	C2820HD_ASSY
CAD Model Name	Document status
C2820HD_ASSY	Sample
Drawn by	Approved by
PS	TEQ
Description	
C2820 Heavy Duty Handbrake & adjuster Assy	
...	
Part #	Configuration
C2820 HD Handbrake	Default
Rev. Date	
...	
Rev. No	
...	
Rev. Date	
...	
Rev. No	
...	
Rev. Date	
...	
Rev. No	
...	

Projection

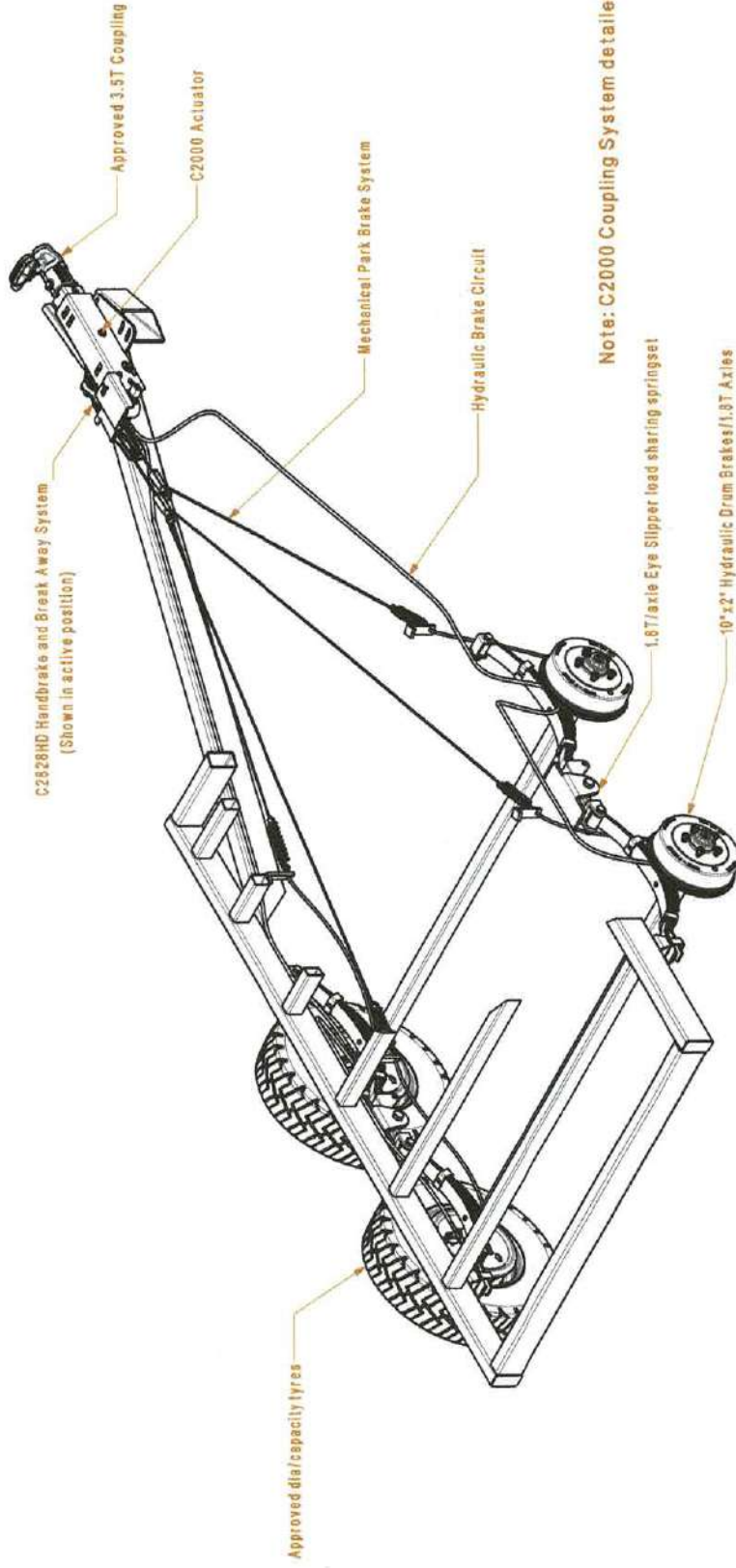


2 Tuna Street,
 Mangawhai 3112
 PO Box 435
 022 235 5600
www.trailequip.co.nz



DO NOT SCALE DIMENSIONS
 UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN MILLIMETERS
 SURFACE FINISH - UNLESS OTHERWISE SPECIFIED
 UNLESS OTHERWISE SPECIFIED
 SURFACE FINISH - UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN MILLIMETERS
 SURFACE FINISH - UNLESS OTHERWISE SPECIFIED

HYGO 2 3.5T Drum Brake Systems



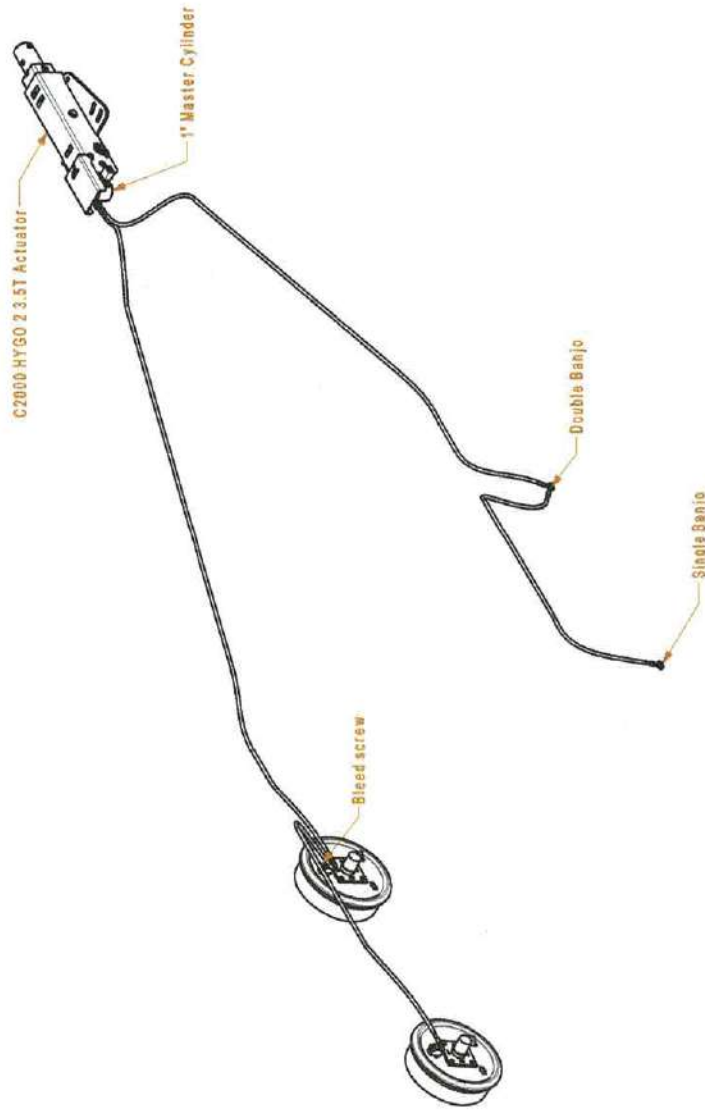
Note: C2000 Coupling System detailed separately

Drawing Name		HYGO_2_3.5T_Schema_2D		Sheet Size		Sheet	
Part /		HYGO3.5		A3(H)		1/3	
Qty/Parent	Parent Part	Projection	Scale	Material	Document status		
...	EDER		1:15	C2000_4x10in_HUDrum	Assembled		
Est. Weight	Coating		...	PS	Drawn by		
...	...		...	...	PS		
Finish	CASS		...	...	Approved by		
...	...		...	...	FEQ		
Description	Min. tensile	2 Tuna Street, Burgessville 9372 Tel: 08 228 8608 www.trailparts.co.nz		Description			
HYGO 2 3.5T Hyd. Drum Override System	...			HYGO 2 3.5T Hyd. Drum Override System			
Supp Title	Min. hardness	Innovative Trailer Solutions		Supp Title			
...	...			Process			
...	...			Systems Integrity			
...	...			Rev.			
...	...			Date of Issue			
...	...			27/05/2020			

DO NOT SCALE DRAWING
 UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN MILLIMETERS
 SURFACE FINISH - UNLESS OTHERWISE SPECIFIED:
 ALL DIMENSIONS ARE TO BE TAKEN TO THE CENTER OF THE DIMENSION LINE
 ALL DIMENSIONS ARE TO BE TAKEN TO THE CENTER OF THE DIMENSION LINE
 ALL DIMENSIONS ARE TO BE TAKEN TO THE CENTER OF THE DIMENSION LINE

COPYRIGHT - DESIGN PROTECTION
 All information is property to the originator and is not to be copied, reproduced or distributed without the written permission of the originator for the express purpose of production for the owner and with his written permission. Any reproduction without written permission is prohibited. In reproduction of this drawing, the originator shall be held liable for any court action for damages.

HYGO 2 Drum Hydraulic System



Sheet

2/3

Drawing Name HYGO_2.3.5T_Schema_2D	
Description HYGO 2.3.5T Hyd. Drum Override System	Part HYGO 2.3.5T
Supplier EGER	Part Name C2000_4X1016_HUDrum_ASSY1
Project Part	Part Size A3(H)
Rev. ...	Rev. Date ...

2 Tuna Street,
Dunedin 9012
Tel: 03 478 8268
www.trailparts.co.nz

TRAILPARTS
Innovative trailer solutions

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED:
+0.1% -0.05% ±0.1%
Surface finish - µm
As cast - 125, honed 6.3, polished 1.6
Reference - check all edges

COPYRIGHT - DESIGN PROTECTION
All information is property to the originator and is not to be copied, reproduced or otherwise distributed without the written permission of the originator. Any breach resulting in reproduction will result in court action for damages.

HYDO 2 Drum Park brake System



Note: Cable connections not shown

Sheet 3/3

Drawing Name HYDO_2_3.5T_Schema_20		Part HYDO 2.5		Description HYDO 2.3.5T Hyd. Drum Override System		Part HYDO 2.5	
Supplier EGER		Supplier EGER		Supplier EGER		Supplier EGER	
3 Tuna Street, Baysville 0372 Tel: 03 439 8808 www.trailparts.co.nz		DO NOT SCALE DRAWING UNLESS OTHERWISE SPECIFIED: SCALE: AS SHOWN TOLERANCES: FRACTIONS: ±0.05 mm DECIMALS: ±0.05 mm Surface finish: as per drawing As cast - as per drawing Machined - as per drawing		COPYRIGHT - DESIGN PROTECTION All information is proprietary to the originator and is not to be copied, reproduced, distributed or otherwise used without the written permission of the originator. Any breach resulting in reproduction will result in court action for damages.		TRAILPARTS Innovative Trailer Solutions	
Rev. ...		Rev. ...		Rev. ...		Rev. ...	