Action : MAURICE-DE-LORRIS Benoît – Renault SAS BASSIEN Jessica – Renault SAS DUDEZERT Marie – Renault SAS VELLUET Yann – Renault SAS **Copy :** DESBARAX Alain – Renault SAS MASI Vincent – Renault SAS FRETET Jean-Luc – Renault SAS FINZI Andrea – Magnetto Wheels ROVARINO Davide – Magnetto Wheels GATTO Fabrizio – Magnetto Wheels LORENZETTI Luka – Magnetto Wheels **Information :** RIGAULT Cyril – Renault SAS CHATOT Philippe – Renault SAS RACOIS Christian – Renault SAS MAILLOT Alain – Renault SAS Storage : base E-tim	**DE-TV - Sce. 64869** **FIABIL. DURAB. Bancs CTL + LM** **Florian DAVID** ☎ : +33 (0)6 46 93 18 05 ✉ : CTL L38 1 33 November 15th 2013

Synthesis Note CTL-64869-13-466

Subject	:	Audit of Magnetto Wheels regarding Renault 31-08-051/--A test procedure (Biaxial wheel test on ZWARP machine)
Goal	:	Assess Magnetto Wheels skills to carry out Renault 31-08-051/--A tests
Expected	:	Your information and taking into account

Summary - Conclusions:

- This note settles the audit of Magnetto Wheels regarding test of wheels on ZWARP machine under Renault 31-08-051/--A procedure in Magnetto Wheels Facility of Rivoli (TO), Italy.
- Informations and documentations given by Magnetto Wheels are clear, have a good formalization level.
- Competences in Magnetto WHeels are of high level.
- Only one item regarding the conformity report has been subjected, however the action plan was already planned.
- Crossed measurements results are positive, Magnetto Wheels' Bench is certified.

SUMMARY

I GENERAL

The audit is structured with the help of question charts included in the 00-10-004 / -- A Renault norm, and with a crossed measurement.

The measurement reference is an X91 steel wheel, instrumented with six active straingages. The purpose of this measurement was to correlate the stress amplitude between the two test rigs (Magnetto Wheels & Renault have same MTS 855 Zwarp machine).

The audit was finalized on the 24th of October 2013, with the followings attendees:

Magnetto Wheels :

- Mr Davide ROVARINO
- Mr Fabrizio GATTO
- Mr Luka LORENZETTI

Renault :

- Mr Florian DAVID

II TECHNICAL AUDIT

Legend of pictograms:

- ☞ : Significant positive point
- ☞ : Corrective action asked by Renault
- ☞ : Corrective action completed by Thyssen-Krupp
- ☞ : Important recommendation made by Renault

CHAPTER 1: KNOWLEDGE OF THE DEFINITION WITH RESPECT TO THE CONFORMITY OF THE PART

1.1 Is there a reference drawing defining the part to be tested?
1.2 Is the operator in possession of the drawing?
1.3 How does the operator correlate the parts with the drawing?
1.4 Is there a separate conformity report relative to the supplier drawing?
1.5 Is the operator familiar with the conformity report?
1.6 How does the operator correlate the parts being tested with respect to the conformity report?

☞ Magnetto Wheels has on its database all definitions of the internal drawing of a wheel project, associated to the last definition of the customer's drawing.
The operator can use this database to check easily the drawing.
If there are modifications about wheel design, it is identifiable by the date of production (and therefore the batch number) stamped on it.

CHAPTER 2 - IMPLEMENTATION OF THE TEST PROCEDURE CONDITIONS – TEST CONDITIONS PERFECTLY DEFINED AND OBSERVED

2.1 Are the date and the change letter of the procedure in accordance with Renault requirements (functional drawing and others)?
2.2 Has the operator the test procedure, and has he read it?

☞ The test report template shows the last index of the Renault Test Procedure.
Magnetto Wheels automatically receive the last definition of the procedure from the technical coordinator.
The operator has always a copy of it on the operative room of the bench.

2.3 Do the vehicle data correspond to those specified by Renault (functional drawing and others)?

☞R&D department received the full loadcase sequence. In the worst case, there are able to calculate it by using the Renault formulas.
R&D department transmit the full sequence to the laboratory with the test request.

CHAPTER 3 – TEST FACILITY CAPACITY - FACILITY CAPABLE OF PROCEDURE

3.1 How are the boundary conditions defined and checked?

☞MW is able to determinate the boundary conditions from drawings and technical data of the vehicle/wheel project.
Of course, MW is aware about the need to use genuine hub and bearing for steel wheels tests.

3.2 If they have not been specified in the procedure, how are the limit conditions defined?

☞Normally, all data are on the test request due to a summary of all technical data. If one is missing, the laboratory responsible asks directly to the R&D department, who can contact Renault in case of need.

3.3 Is there a document defining the machine characteristics and performances?

☞The second page of the document "*Scheda strum. 222 rev.0 file*" shows the technical characteristics of the MW's ZWARP machine.

3.4 What method has been used to check that the facility is able to apply the test procedure with the required level of accuracy?

☞Except the hydraulic engine for acceleration event (loosening bolts test procedure), Magnetto Wheels has the same ZWARP test bench as Renault.
Renault people already know the technical characteristics of this machine, the Renault test procedure was built on it.

CHAPTER 4 – TEST IMPLEMENTATION – REQUIRED FORCES OR DISPLACEMENT OBTAINED WITH SUFFICIENT ACCURACY.

4.1 What calibration procedure is used for the measurement systems?
4.2 Does the frequency of calibration ensure reliability of the test and of the procedure?
4.3 How does the operator manage calibration of the measurement system?

☞ MW is doing own calibration for F_Z and F_Y load cells with the MTS calibration device.
Mx and My load cells are dismounting to be calibrated on a press.
The load cells calibration frequency is each year.
The MTS calibration device's frequency is every 7 years by MTS (this system is used once per year)
The calibration is monitored and the need is automatically known several weeks ago.

Otherwise, there is a time out when the date is came and a red flag indicates the impossibility to use the machine.

4.4 How is the effective force cycle compared with the Renault requirement?

Renault compared the Magnetto Wheels' bench to the Renault one with an instrumented steel wheel, to acquire the stress amplitude of the straingages from the following sequence:

	F_Y (daN)	F_Z (daN)
Loadcase 1	6140	7950
Loadcase 2	3670	7290
Loadcase 3	-200	5020
Loadcase 4	-1220	4490
Loadcase 5	5730	17600
Loadcase 6	-2290	7530
Loadcase 7	-2620	5550

For each loadcase, Magnetto Wheels' bench calculates the M_X value to reach, and the machine did its own iteration to determinate the good camber corresponding to this M_X value.

4.5 Has the comparison of the effective displacement with the Renault requirement been registered?

A telemetry system mounting on the center of the wheel transmits the stress amplitude of the straingages to the Renault acquisition computer.
All data are stored on this computer.

For each point of the specification, an error is calculated and compared to the acquisitions already did on the Renault Test Rig.

CHAPTER 5 – TEST PERFORMANCE – CHARACTERIZING THE PARTS ACCORDING TO RENAULT PROCEDURE.

5.1 Has the operator been trained to perform the procedure properly?

☞ Today, there is no fully trained operator.

☞ At the end of the year 2013, Mr Gatto will train Mr Lorenzetti and Mr Marangon to realize a complete Overturning Moment Mapping and Durability tests.
This item will be finalize in February 2014, as indicate in the training document "*corso - utilizzo macchina MTS*".

5.2 How does the operator check the test conditions throughout the whole duration of the test?

☞ The Laboratory responsible guarantees by sign the input data and the correct setup of the machine before the test by sign.
During the test, the machine controls the limits set at the start of the test, and stop it in case of loosening stiffness, pressure lost.
After a limit stop, the operator checks the origin, fix it if it is possible and restart the test.

The "*SK_IMP_X85_6Jx15*" document shows these.

5.3 How does the operator evaluate failure criteria?

☞ The operator identifies the failure by using dye penetrant test.
This test is done when a tire blows, at the end of the test.

5.4 How are incident which occur during the test recorded?

☞ The test report "*SK_IMP_X85_6Jx15*" present a Test Log where are recorded all the events of the durability test.

CHAPTER 6 – PROCESSING THE RESULTS – SPECIALIST OPINION OF CONFORMITY ENDORSED ON TEST REPORT.

6.1 Are the test the subject of a test report?
6.2 Have the results been submitted according to Renault requirements?
6.3 How is the validity of the report ensured?

☞ Magnetto Wheels design the "*SK_IMP_X85_6Jx15*" document from the Renault Test Procedure requirements about test report.
The laboratory responsible ensures the validity of the test report by his sign.
.

6.4 What methods have been used to ensure that the persons analyzing the results have the required level of expertise (training, experience)?

☞ The operators will use the same level of expertise that the other tests done by the lab. They were trained to detect the failures for this kind of test.

6.5 How was the procedure with Renault test facilities correlated?
6.6 Does the comparison indicate equivalence of the facilities?

Below are the stress measurements done at Renault Lardy and Magnetto Wheels for the complete sequence:

		Loads		Amplitude Stress (µdef)					
		Fz	Fy	J2	J3	J4	J6	J7	J8
Renault	LC1	7950	6140	1916	1339	2921	2008	926	1258
	LC2	7290	3670	1333	894	1951	1348	622	920
	LC3	5020	-200	336	206	422	298	331	393
	LC4	4490	-1220	167	97	187	119	420	301
	LC5	17600	5730	2579	1808	3905	2635	1055	1738
	LC6	7530	-2290	290	132	262	177	456	668
	LC7	5550	-2620	331	228	492	318	532	412

		Loads		Amplitude Stress (µdef)					
		Fz	Fy	J2	J3	J4	J6	J7	J8
Magnetto Wheels	LC1	7950	6140	1916	1361	3008	2018	898	1287
	LC2	7290	3670	1287	916,4	1916	1324	583	898
	LC3	5020	-200	278	194,4	389	259	361	315
	LC4	4490	-1220	157	92,56	213	139	518	185
	LC5	17600	5730	2509	1777	3832	2610	1009	1592
	LC6	7530	-2290	222	129,6	278	213	555	417
	LC7	5550	-2620	333	240,7	555	370	592	342

From these acquisitions, we were able to make this comparison table where the percentage mean the stress amplitude at MW regarding Renault :

	Amplitude Stress (µdef)					
	J2	J3	J4	J6	J7	J8
LC1	0%	-2%	-3%	0%	3%	-2%
LC2	4%	-2%	2%	2%	7%	2%
LC3	21%	6%	9%	15%	-8%	25%
LC4	6%	5%	-12%	-14%	-19%	63%
LC5	3%	2%	2%	1%	5%	9%
LC6	31%	2%	-6%	-17%	-18%	60%
LC7	-1%	-5%	-11%	-14%	-10%	20%

The strong loadcases correlation (where stress amplitude is higher – LC1, LC2, LC5) is good.

For the loadcases where F_Y/F_Z ratio is low (LC3, LC4, LC6, LC7), correlation is less good. These loadcases are the least damaging to the wheel (the stress amplitude is low), and with the dispersion due to the tire, we know it will be hard to do a better correlation.

☞ With these results, Renault decides that the two MTS benches (Magnetto Wheels and Renault) are correlated.

CHAPTER 7 – FILING THE RESULTS – TRACEABILITY

7.1 does a test file exist?
7.2 How have the test reports and test files been filed?

☞ Each wheel project has a digital folder with test report, conformity report, drawings, customer's drawing, test request, test log and pictures.
These folders are consigned into a data server.

☞ All specimens are stored during a period of two months (except particular requests).
Folders and documents are stored on database forever, and paper documents for 15 years.

1- Oggetto della Scheda

La presente fornisce:

- Informazioni di carattere generale
- Procedura di taratura / controllo
- Manutenzioni programmate, straordinarie, preventive
- Accessori

in merito alla gestione della Macchina Rullo Biassiale MTS.

2- Ambito di applicazione della Scheda

Gestione dello strumento:

Matricola:	**MR025**
Nome:	**Macchina RULLO BIASSIALE MTS**
Costruttore:	**MTS**
Modello:	**WT855**

Revisione	Data	Oggetto dell'aggiornamento
0	22.08.2013	Stesura

3- Contenuto

3.1 INFORMAZIONI DI CARATTERE GENERALE

Finalità

Fornire informazioni di carattere generale sullo strumento Macchina Rullo MTS, secondo quanto indicato dall'Istruzione Operativa B10.

Generalità

Nome strumento:	Macchina Rullo Biassiale MTS
Matricola:	MR 025
Costruttore:	MTS
Modello:	WT888
Fornitore:	MTS
Anno di acquisto:	2006
Ubicazione:	Sala MTS
Tipo di Prove:	A fatica su rullo
Normativa M.W.:	P.O. B10, Istruzioni Operative PO10, PO11, PO13, PO22
Norme internazionali:	-
Norme clienti:	Renault 31 - 08 - 051 / - - A
Manuale di istruzioni:	Manuale utente del software di collaudo (100192743a_man oper ita.pdf)

Caratteristiche tecniche

- FZ (rad) 0 ÷ 45 kN precisione ± 2 %
- FY (lat) ±25 kN precisione ± 2 %
- MX1 ±100 kN precisione ± 2 %
- MX2 ±100 kN precisione ± 2 %
- camber ± 30°
- Vel max rullo 1000 giri/min
- Gruppo PC/SUN Workstatio con software MTS dedicato

Dimensioni limite ruote da provare :

rullo (D = 840mm)	Diametro dello pneumatico 610 – 700 mm
rullo (D = 970mm)	Diametro dello pneumatico 700 – 850 mm.

3.2 PROCEDURA DI UTILIZZO

Vedi procedura MTS "100192743a_man oper ita.pdf; manuale realizzato dal fornitore appositamente per MW

3.3 PROCEDURA DI TARATURA

Vedi procedura MTS "100021446C_ calibrazione pp 139 158 ingl.pdf", da pp 151 a 158.
Il sw della macchina è dotato di un programma per la verifica ed eventuale taratura dei canali FZ, FY, MX1 ed MX2. Il valore massimo di errore è +/-2%. I valori di errore e taratura vengono memorizzati automaticamente dal SW. In caso di superamento del valore massimo consentito eseguire taratura automatica. Al termine della verifica introdurre i dati nel SW di gestione degli strumenti.
La frequenza annuale. La cella campione di confronto per i carichi FZ ed FY ci è stata fornita dal costruttore insieme ai supporti per collegarla in serie alle celle da verificare.
Per le celle MX1 e MX2 mettiamo in serie la cella campione Sk 211 utilizzando la procedura di prova IO 22

3.4 PROCEDURA DI MAUTENZIONE

Fare riferimento al manuale "100187232b man manut ingl.pdf" pp 55-56-57:
Di seguito sintesi di quanto chiesto :

Descrizione	Frequenza	Registrazione su sistema informatico
Verifica livello olio idraulico ed indicatore del filtro	Ogni giorno di prova	No
Verifica livello grasso ingranaggio tavola	Ogni giorno di prova	No
Verifica pressione e condizione freni	Ogni inizio prova	No
Verifica livello olio cuscinetti	Ogni inizio prova	No
Verifica emergenza, cablaggi, filtri aria console	Ogni inizio richiesta o mese	No
Controlla ed azzera limite temperatura olio	Ogni inizio richiesta o mese	No
Lubrificare cuscinetti motore	Ogni inizio richiesta o mese	No
Verifica condizioni scambiatore	Ogni 3 mesi	Si
Analizza condizioni olio	Ogni 3 mesi	Si
Verifica tensione cinghia	Ogni 3 mesi	Si
Lubrifica sistema di applicazione Fz (belt)	Ogni 3 mesi	Si
Lubrifica cuscinetti su base	1 volta anno	Si
Cambia posizione tavola	1 volta ogni 2 anni	Si

3.5 IDENTIFICAZIONE DELL'AVVENUTA MANUTENZIONE E TARATURA

- Registrare sull'archivio elettronico (vedi P.O. 20) tutti i dati relativi all'intervento di manutenzione, taratura-controllo.
- Ad ogni controllo con esito positivo, applicare un nuovo bollino sulla targhetta dello strumento

MW

Corso di formazione per:

ADDETTO RULLO BIASSIALE MTS

Data inizio corso:	9/4/2013
Data fine corso:	In corso, fine prevista 10/2/14
Partecipanti:	MARANGON Alessandro - LORENZETTI Paolo
Tutore:	GATTO Fabrizio
Obiettivo del corso:	Fornire ai partecipanti i requisiti teorico / pratici per utilizzare in modo autonomo e sicuro la machina in oggetto; dal montaggio della ruota alla creazione dei programmi di prova
Metodo del corso;	- Lezioni teoriche - Prove pratiche in affiancamento al tutore - Prove pratiche svolte dal partecipante
Valutazione:	Consiste nel verificare il corretto svolgimento delle prove pratiche eseguite dai partecipanti
Argomenti / riferimenti:	Vedi pag. 2
Tempistiche:	Vedi pag. 2
Miglioramenti	utilizzo maggiore del rullo biassiale con diminuzione del carico di lavoro del bi posto . Polivalenza addetti. Maggiori possibilità di fare correlazioni con altre macchine di prova
Azioni da completare (Al 30/8/13)	Formazione per realizzare programma di prova Completamento istruzioni per il cambio dei rulli con nuovo sistema di sollevamento (in previsione per dicembre 2013) Implementazione dei risultati di prova con il sistema di archiviazione delle altre macchine e relative istruzioni di gestione

Il Tutore

Fabrizio Gatto

Il Responsabile del servizio

CORSO DI FORMAZIONE

"ADDETTO RULLO BIASSIALE MTS"

Descrizione	Riferimento Documet.	Formazione teorica	Pratica in affiancamento	Prove pratiche	Valutazione (a cura del tutore)	
					Lorenzetti	Marangon
Montaggio smontaggio attrezzatura originale e falso mozzo	Manuale MTS 100192743a	9/4/13	9/4/13	10/4/13	OK	OK
Richiamare programma settare macchina montare/smontare ruota reagire agli errori principali durante prova leggere i cicli		15/4/13	16/4/13	16/4/13	OK	OK
Sostituzione TAMBURO		27/5/13	27/5/13	27/5/13	OK	OK
Verifica celle di carico		23/7/13	24/7/13	24/7/13	OK	OK
Manutenzione macchina	Manuale MTS 100021446C	29/8/13	29/8/13 30/8/13	30/8/13	OK	OK
Creazione programmi con OMM	Manuale MTS 100192743a	Attività prevista da inizio dicembre 2013 fino al 10/2/14				

DATA	PARTECIPANTI		TUTORE
	MARANGON Alessandro	LORENZETTI Paolo	GATTO Fabrizio
30/8/13			

MW LAB MW Italia	SCHEDA IMPOSTAZIONE PROVE A FATICA	Macchina	Data	Numero SK
		Rullo BIASSIALE MTS	21/10/2013	**500**

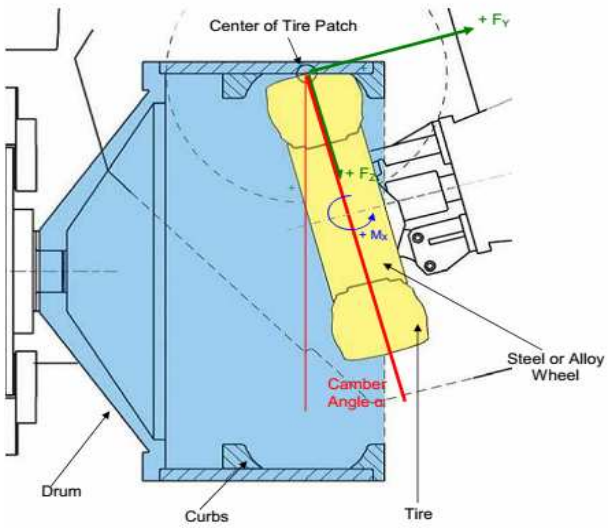
DATI RUOTA

Disegno MW	Disegno Originale	Cliente Modello

DIMENSIONI	ET	MAT disco	Spess [mm]	MAT cerchio	Spess [mm]

Carico ruota [kg]	Pneumatico	Press [bar]	Coppia [daNm]	PROCEDURA DI PROVA
				Renault 31 - 08 - 051 / - - A FATIGUE TEST ON ZWARP TEST BENCH

Schema macchina e convenzione segni



Diametro tamburo scelto	

CURB	da foglio "curb space"		
Spazio TOT	n dist da 97	n dist da 72	altezza rondelle [mm] se necessarie
	n dist da 51	n dist da xx	

ELENCO MATERIALE ORIGINALE NECESSARIO

Per testare n°6 prove occorrono :

Decsrizione	Q.tà	Dis Originale
Viti		
disco freno	6	
viti per dico freno	2	
mozzo	6	
cuscinetto	6	
albero trasmissione	2	
dado per albero tras.	2	
Istruzioni MONTAGGIO		
Disegno attrezz. Supporto		

ELENCO MATERIALE per FALSO MOZZO

Per testare n°6 prove occorrono :

Decsrizione	Q.tà	Dis Originale
Viti		
Disegno falso mozzo		

N°carico	Fz	Fy	Vel	Cicli		CA	Mx	Note
	N	N	km/h	a ripetizione	totali	deg	Nm	
1	7950	6140						
2	7290	3670						
3	5020	-200						
4	4490	-1220						
5	17600	5730						
6	7530	-2290						
7	5550	-2620						
8								
9								
10								
11								
12								
			rip totali		cicli totali			

Definizione LIMITI

		Speciment limit		Test limit	
Caratteristica	udm	Sup	inf	Sup	inf
Fz	N				
Fy	N				
Y	mm				
LR	mm				
CA	deg				
VD	km/h				

per compilazione vedi foglio Test_Limit_Definition

File FINALI

Tipo file	Nome file
Limiti ruota	
Limiti SP/TEST	
Durab. Test	

OPERATORE	VISTO Resp.

MW LAB MW Italia	RAPPORTO PROVA DI RESISTENZA ALLA FATICA	Macchina	Data	Rapporto
		Rullo BIASSIALE MTS	21/10/2013	**122,01**
		Matr. MR 025	RDL	122/13

DATI RUOTA

Disegno MW	Disegno Originale	Cliente Modello

MAT disco	Spess [mm]	Fornitore mat disco	MAT cerchio	Spess [mm]	Fornitore mat cerchi

Linea disco	Lotto disco	Linea cerchio	Lotto cerchio	Linea montaggio	Lotto montaggio

Peso ruota [g]	Stato sup ruota	SCOPO PROVA

DATI DI PROVA

N°SK_IMP	File ruota	File LIMITI	File durab.	Data inizio prova

OPERATORE	Coppia prova [daNm]	Pneumatico	Press [bar]	Cicli richiesti

NOTE DURANTE PROVE

N°Nota	Data, ora, cicli	N°progr. di **RIPETIZ.**	N°progr. CARICO	DESCRIZIONE

FOTO Ruota a fine prova CON LIQUIDI

FINE PROVA			
Tempo prova effettivo		DATA FINE PROVA	
Cicli a fine prova	%	N°ripetiz.	N°carico
COPPIA CHIUSURA [daNm] - la residua DEVE esser maggiore del 40%			
Descrizione rottura			

ESITO PROVA	VISTO Resp.

INTERNAL CURBS SPACE

Internal curb positioning rule

inner space curbs = tyre tread width + 20 mm

INSERT TYRE TREAD WIDTH

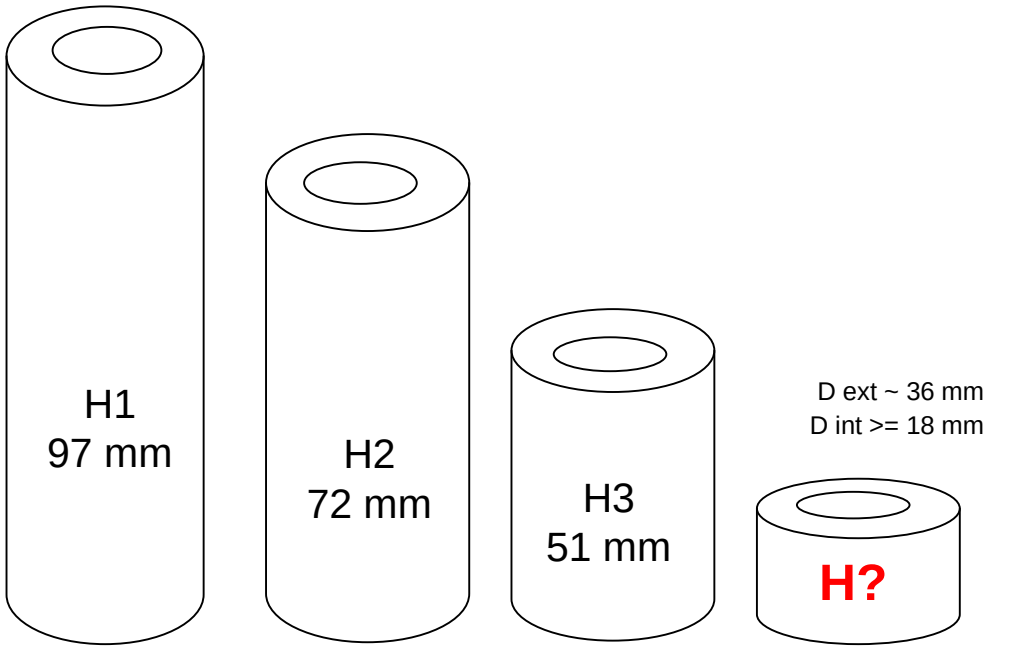
100 mm

Spacers:

H1	97 mm
H2	72 mm
H3	51 mm
external diameter	36 mm
internal diameter	18 mm
external curb width	76 mm
internal curb width	89 mm
drum width	495 mm

Internal curb space from drum bottom	210 mm

Internal curbs space	**120 mm**
External curbs space	285 mm



NEW SPACER NEEDED

SPACER	X	X		41 mm

LIMITS EVALUATIONS

INSERT INFORMATION TO DEFINE CORRECT LIMITS

Data			
Tyre	185	/ 65	R 15
OMM / SM procedures			
CA max	15	deg	
CA min	-14,5	deg	
Machine set			
CA max positive	15,5	deg	
CA max negative	-14,5	deg	
Drum Diameter	840	mm	
External curbs space	302	mm	
Test Program			
(max +Fz, Fy)	18364	6121	N
(min Fz, Fy)	4081	-1148	N
(Fz, max +Fy)	18364	6121	N
(Fz, max -Fy)	4591,08	-2678,13	N

SPECIMENT LIMITS

	max/positive	min/negative	
Fz	20364	-1000	N
Fy	8121	-4678,13	N
Y	311	16	mm
LR	496	229	mm
CA	15,5	-14,5	deg
VD	690	-25	rpm

TEST LIMITS

LOAD LIMITS			
	Upper Radial	19364	N
	Lower Radial	-1000	N
	Upper Lateral	7121	N
	Lower Lateral	-3678,13	N
CAMBER LIMITS			
	Upper Camber	15,5	deg
	Lower Camber	-14,5	deg
DISPLACEMENT LIMITS			
	Upper Lateral	260	mm
?	Lower Lateral	67	mm
	Upper Radial	445	mm
?	Lower Radial	251	mm
TORQUE LIMITS			
	Upper Torque Fbk	default	
	Lower Torque Fbk	default	

TEST LIMIT DEFINITION

legend	
+	upper or positive
-	lower or negatve

There are THREE levels of LIMITS (far/big -> close/small):

Machine Limits:

Emergency Stop -> abort test, emergency brake drum, turns off Drive and Hydraulics

Specimen Limits:

Emergency Stop -> abort test, emergency brake drum, turns off Drive and Hydraulics

Test Limits

without brake seq: **Test Stop** -> abort test, move wheel in Home, Hydraulics and Drive on
with brake seq: also Cooldown State until the timeout period has elapsed or Temperatures limits falls below the threshold

MACHINE LIMITS

defined/imposed from MTS

SPECIMEN LIMITS

They are SET to protect the specimen.

	Fy, Fz	max loads that we consider critical for the wheel: +/- 1000N greater than Test Limits
?	Y	max axial limits that the wheel can reach without hit the machine structure: **+/- 2"** larger than Test Limits
?	LR max	max radial limit that the wheel can reach without hit the machine structure: **+ 2"** larger than Test Limits
	LR min	min radial limit that the wheel can reach without hit the machine structure: = (Wheel Diameter / 2) + 1.5"
	CA	evaluate manually during the machine initialization following the procedure: apply worst load pairs: (max Fz, Fy), (Fz, maxFy) run the drum to 20 rpm move + and - manually the CA until to have ~20mm of gap between Spindle and Drum CAmax(+) and CAmin(-) have been found
	VD	typically not considered: max admissible 690rpm and min -25rpm

TEST LIMITS

They are SET to ensure the integrity of the test

LOAD LIMITS		
	Upper Radial	+1000N greater than the max positive test Fz
	Lower Radial	not important: set to -1000N
	Upper Lateral	+1000N greater than the max positive test Fy
	Lower Lateral	+500N greater than the max negative test Fy
CAMBER LIMITS		
	Upper Camber	+1 deg larger that the max positive CA evaluate from the procedures OMM or SM and **lower** than Specimen Limit
	Lower Camber	+1 deg larger that the max negative CA evaluate from the procedures OMM or SM and **lower** than Specimen Limit
DISPLACEMENT LIMITS		
	Upper Lateral	= External Curbs Space - (Tyre Width / 2) + 2"
?	Lower Lateral	= (Tyre Width / 2) **- 0"**
	Upper Radial	>= (Drum Diameter / 2) + 1"
?	Lower Radial	= (Wheel Diameter / 2) + (Tyre Width * Tyre Ratio /100) *** 0.5** tyre sensitivity
TORQUE LIMITS		
	Upper Torque Fbk	default
	Lower Torque Fbk	default

NOTE

Could be useful monitor, during the first lap of durability test (or during the OMM/SM procedures), all the displacement variables (Ymax/min, LRmax/min) in order to close the TEST LIMITS.
In order to satisfy the previous consideration could be useful to perform a Data Acquisition Variables (Y, LR) during the OMM / SM procedures

CELLE CARICO CAMPIONE

FZ

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290

Calibration Report

Report Number: 1579-252321
Site: 33068

Customer Name: Magnetto

System: 5 Kip
System ID: Location: MTS Cal. Lab.

Equipment

Device Type: Force Model: 661.20E-02 Serial No.: 252321
Controller/Conditioner Model:497.22 Serial No.: 03002099-2
Readout Device Model:497.22 Serial No.: 0302099 Channel: 2

Procedure

MTS Procedure: Cal-Lab Calibration ACS Version: 6.2
Calibration has been performed in accordance with: 1479
Method of Verification: Set-the-Force Method using Elastic Calibration Devices

Calibration Equipment Asset No.

Dead Weight Set: HighLevel Board: LowLevel Board: Standard Asset No.: 15285
DW Compensation: DMM: 17685 Digital Indicator: 17686 Lower Limit: 1.8347 kN
Temperature Readout: 13574 Additional Equipment: Standardizer: 13102

Conditions

Ambient Temperature: 75.20 °F Polarity(+): Tension Bidirectional: Cable Length: 100 Feet

In Tolerance	X	**As Found:**	X	**Tolerance: +/-1.0% of Applied Force**
Out of Tolerance		**As Adjusted:**		**As Found System Condition:** Good

Conditioner Parameters

Excitation: 9.5020 Delta K: 1.0000 Zero Offset: 0.0000 Multiplier: Cal Res: 49.9 kohms
Shunt Cal: Positive: -40.7804 Negative: 40.7708 Range Gain: PreAmp Gain: 64 Post Amp/FineGain: 7.58301 Polarity: Normal

Calibration Data **Range:** 1
Compression **Resolution:** 0.0058 **Full Scale:** 50
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	0.0027	0.0000	0.00	0.0027	0.01
-20	-9.9890		0.0110	-0.11		
-40	-19.9870		0.0130	-0.07		
-60	-29.9810		0.0190	-0.06		
-80	-39.9830		0.0170	-0.04		
-100	-49.9750		0.0250	-0.05		

Tension **Range:** 1
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	-0.0003	0.0000	0.00	0.0003	0.00
20	9.9905		0.0095	-0.09		
40	19.9820		0.0180	-0.09		
60	29.9700		0.0300	-0.10		
80	39.9590		0.0410	-0.10		
100	49.9650		0.0350	-0.07		

Errors at Zero are computed in % of Range.
The resolution of this Data Set is reflected in the least significant digit reported.
Transducer preloaded at both ends to 115% of full scale capacity.
MTS Calibration Laboratory force measurement expanded uncertainty (U): ±0.25% of applied force
U is calculated using a coverage factor (k) of 2.0, for an estimated confidence probability of 95%.

Out of Tolerance in % column

Notes:

Performed By: Julie Grangroth Date: 13-Jun-07

Signature:

ACSCLRep-CalLab Rev B.
JMG 5-8-2007

CELLE CARICO CAMPIONE

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290

Calibration Report

FY

Report Number: 1579-250092
Site: 33068

Customer Name: Magnetto

System: 5 Kip
System ID: Location: MTS Cal. Lab.

Equipment

Device Type: Force Model: 661.20E-01 Serial No.: 250092
Controller/Conditioner Model:497.22 Serial No.: 03002099-1
Readout Device Model:497.22 Serial No.: 03002099 Channel: 1

Procedure

MTS Procedure: Cal-Lab Calibration ACS Version: 6.2
Calibration has been performed in accordance with: 1479
Method of Verification: Set-the-Force Method using Elastic Calibration Devices

Calibration Equipment Asset No.

Dead Weight Set: HighLevel Board: LowLevel Board: Standard Asset No.: 16261
DW Compensation: DMM: 17685 Digital Indicator: 17686 Lower Limit: .44482 kN
Temperature Readout: 13574 Additional Equipment: Standardizer: 13102

Conditions

Ambient Temperature: 72.50 °F Polarity(+): Compression Bidirectional: Cable Length: 100 Feet

In Tolerance X **As Found:** X **Tolerance: +/-1.0% of Applied Force**
Out of Tolerance **As Adjusted:** **As Found System Condition:** **Good**

Conditioner Parameters

Excitation: 9.5020 Delta K: 1.0000 Zero Offset: 0.0000 Multiplier: Cal Res: 49.9 kohms
Shunt Cal: Positive: 20.7831 Negative: -20.7106 Range Gain: PreAmp Gain: 64 Post Amp/FineGain: 7.71729 Polarity: Inverted

Calibration Data **Range:** 1
Compression **Resolution:** 0.0024 **Full Scale:** 25
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	0.0014	0.0000	0.00	0.0014	0.01
20	5.0033		0.0033	0.07		
40	9.9959		0.0041	-0.04		
60	15.0020		0.0020	0.01		
80	20.0000		0.0000	0.00		
100	25.0030		0.0030	0.01		

Tension **Range:** 1
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	0.0014	0.0000	0.00	0.0014	0.01
-20	-4.9982		0.0018	-0.04		
-40	-9.9967		0.0033	-0.03		
-60	-14.9870		0.0130	-0.09		
-80	-19.9920		0.0080	-0.04		
-100	-24.9920		0.0080	-0.03		

Errors at Zero are computed in % of Range.
The resolution of this Data Set is reflected in the least significant digit reported.
Transducer preloaded at both ends to 115% of full scale capacity.
MTS Calibration Laboratory force measurement expanded uncertainty (U): ±0.25% of applied force
U is calculated using a coverage factor (k) of 2.0, for an estimated confidence probability of 95%.

Out of Tolerance in % column

Notes:

Performed By: Julie Grangroth Date: 13-Jun-07

Signature:

ACSCLRep-CalLab Rev B.
JMG 5-8-2007

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290

Calibration Report

Report Number: 5064-251462
Site: 33068

Customer

Name: Magnetto Wheels Spa

System: 20 kip

System ID:

Location: MTS Cal Lab

Equipment

Device Type: Force | Model: 661.20E-03 | Serial No.: 251462

Controller/Conditioner Model: 497.22 | Serial No.: 0313282

Readout Device Model: 497.22 | Serial No.: 0313282 | Channel: MX1

Procedure

MTS Procedure: Cal-Lab Calibration | ACS Version: 5.23.02b

Calibration has been performed in accordance with: 1479

Method of Verification: Set-the-Force Method using Elastic Calibration Devices

Calibration Equipment Asset No.

Dead Weight Set: | HighLevel Board: | LowLevel Board: | Standard Asset No.: 16264

DW Compensation: | DMM: 17206 | Digital Indicator: 17200 | Lower Limit: 1.7793 kN

Temperature Readout: 18377 | Additional Equipment: | Standardizer: 13102

Conditions

Ambient Temperature: 75.00 °F | Polarity(+): Compression | Bidirectional: | Cable Length: 100 Feet

In Tolerance	X	**As Found:**	X	**Tolerance: +/-1.0% of Applied Force**
Out of Tolerance		**As Adjusted:**		**As Found System Condition:** Good

Conditioner Parameters

Excitation: 9.5020 | Delta K: 1.0003 | Zero Offset: 0.0000 | Multiplier: | Cal Res: 49.9 kohms

Shunt Cal: Positive: 82.222 | Negative: -82.252 | Range Gain: | PreAmp Gain: 64 | Post Amp/FineGain: 7.64648 | Polarity:

Calibration Data Range: 1

Compression Resolution: 0 Full Scale: 100

Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.000	-0.009	0.000	0.00	0.009	-0.01
20	19.993		0.007	-0.03		
40	39.994		0.006	-0.02		
60	59.996		0.004	-0.01		
80	80.010		0.010	0.01		
100	100.020		0.020	0.02		

Tension Range: 1

Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.000	-0.004	0.000	0.00	0.004	0.00
-20	-20.017		0.017	0.09		
-40	-40.000		0.000	0.00		
-60	-60.006		0.006	0.01		
-80	-80.000		0.000	0.00		
-100	-99.996		0.004	0.00		

Errors at Zero are computed in % of Range.
The resolution of this Data Set is reflected in the least significant digit reported.
Transducer preloaded at both ends to 115% of full scale capacity.
MTS Calibration Laboratory force measurement expanded uncertainty (U): ±0.25% of applied force
U is calculated using a coverage factor (k) of 2.0, for an estimated confidence probability of 95%.

Out of Tolerance in % column

Notes: Range 1

Performed By: Eric Hogendorf | Date: 22-Dec-06

Signature:

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290

Calibration Report

Report Number: 5064-241444
Site: 33068

Customer Name: Magnetto Wheels Spa
System: 20 kip
System ID: Location: MTS Cal Lab

Equipment

Device Type: Force Model: 661.20E-03 Serial No.: 241444
Controller/Conditioner Model: 497.22 Serial No.: 0313282
Readout Device Model: 497.22 Serial No.: 0313282 Channel: MX2

Procedure

MTS Procedure: Cal-Lab Calibration ACS Version: 5.23.02b
Calibration has been performed in accordance with: 1479
Method of Verification: Set-the-Force Method using Elastic Calibration Devices

Calibration Equipment Asset No.

Dead Weight Set: HighLevel Board: LowLevel Board: Standard Asset No.: 16264
DW Compensation: DMM: 17206 Digital Indicator: 17200 Lower Limit: 1.7793 kN
Temperature Readout: 18377 Additional Equipment: Standardizer: 13102

Conditions

Ambient Temperature: 75.00 °F Polarity(+): Compression Bidirectional: Cable Length: 100 Feet

In Tolerance	X	**As Found:**	X
Out of Tolerance		**As Adjusted:**	

Tolerance: +/-1.0% of Applied Force
As Found System Condition: Good

Conditioner Parameters

Excitation: 9.5020 Delta K: 0.9998 Zero Offset: 0.0000 Multiplier: Cal Res: 49.9 kohms
Shunt Cal: Positive: 83.75 Negative: -83.357 Range Gain: PreAmp Gain: 64 Post Amp/FineGain: 7.76611 Polarity:

Calibration Data Range: 1
Compression Resolution: 0 Full Scale: 100
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.000	-0.001	0.000	0.00	0.001	0.00
20	19.998		0.002	-0.01		
40	39.999		0.001	0.00		
60	59.999		0.001	0.00		
80	80.001		0.001	0.00		
100	100.020		0.020	0.02		

Tension Range: 1
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.000	0.001	0.000	0.00	0.001	0.00
-20	-19.988		0.012	-0.06		
-40	-39.990		0.010	-0.02		
-60	-59.998		0.002	0.00		
-80	-79.989		0.011	-0.01		
-100	-100.000		0.000	0.00		

Errors at Zero are computed in % of Range.
The resolution of this Data Set is reflected in the least significant digit reported.
Transducer preloaded at both ends to 115% of full scale capacity.
MTS Calibration Laboratory force measurement expanded uncertainty (U): ±0.25% of applied force
U is calculated using a coverage factor (k) of 2.0, for an estimated confidence probability of 95%.

Out of Tolerance in % column

Notes: Range 1

Performed By: Eric Hogendorf Date: 22-Dec-06

Signature:

ACSCLRep-CalLab Rev B.
JMG 5-8-2007

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290

Calibration Report

Report Number: 5064-233992
Site: 33068

Customer

Name: Magnetto Wheels Spa

System: 20 kip
System ID:
Location: MTS Cal Lab

Equipment

Device Type: Force
Model: 661.20E-01
Serial No.: 233992
Controller/Conditioner Model: 497.22
Serial No.: 0313282
Readout Device Model: 497.22
Serial No.: 0313282
Channel: FY

Procedure

MTS Procedure: Cal-Lab Calibration
ACS Version: 5.23.02b
Calibration has been performed in accordance with: 1479
Method of Verification: Set-the-Force Method using Elastic Calibration Devices

Calibration Equipment Asset No.

Dead Weight Set:
HighLevel Board:
LowLevel Board:
Standard Asset No.: 11966
DW Compensation:
DMM: 17206
Digital Indicator: 17200
Lower Limit: .81073 kN
Temperature Readout: 18377
Additional Equipment:
Standardizer: 13102

Conditions

Ambient Temperature: 76.60 °F
Polarity(+): Compression
Bidirectional:
Cable Length: 100 Feet

In Tolerance	X	**As Found:**	X
Out of Tolerance		**As Adjusted:**	

Tolerance: +/-1.0% of Applied Force
As Found System Condition: Good

Conditioner Parameters

Excitation: 9.5020
Delta K: 1.0005
Zero Offset: 0.0000
Multiplier:
Cal Res: 49.9 kohms
Shunt Cal: Positive: 20.495 Negative: -20.46
Range Gain:
PreAmp Gain: 64
Post Amp/FineGain: 7.60742
Polarity:

Calibration Data

Compression
Range: 1
Resolution: 0
Full Scale: 25
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	-0.0011	0.0000	0.00	0.0011	0.00
20	4.9978		0.0022	-0.04		
40	9.9995		0.0005	0.00		
60	14.9990		0.0010	-0.01		
80	20.0010		0.0010	0.00		
100	25.0040		0.0040	0.02		

Tension
Range: 1
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	-0.0002	0.0000	0.00	0.0002	0.00
-20	-4.9975		0.0025	-0.05		
-40	-9.9982		0.0018	-0.02		
-60	-15.0000		0.0000	0.00		
-80	-20.0000		0.0000	0.00		
-100	-24.9960		0.0040	-0.02		

Errors at Zero are computed in % of Range.
The resolution of this Data Set is reflected in the least significant digit reported.
Transducer preloaded at both ends to 115% of full scale capacity.
MTS Calibration Laboratory force measurement expanded uncertainty (U): ±0.25% of applied force
U is calculated using a coverage factor (k) of 2.0, for an estimated confidence probability of 95%.

Out of Tolerance in % column

Notes: Range 1

Performed By: Eric Hogendorf

Date: 26-Dec-06

Signature:

ACSCLRep-CalLab Rev B.
JMG 5-8-2007

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290

Calibration Report

Customer Name: Magnetto Wheels Spa

Report Number: 5064-252322
System: 20 kip
Site: 33068
System ID:
Location: MTS Cal Lab

Equipment

Device Type: Force
Model: 661.20E-03
Serial No.: 252322
Controller/Conditioner Model: 497.22
Serial No.: 0313282
Readout Device Model: 497.22
Serial No.: 0313282
Channel: FZ

Procedure

MTS Procedure: Cal-Lab Calibration
ACS Version: 5.23.02b
Calibration has been performed in accordance with: 1479
Method of Verification: Set-the-Force Method using Elastic Calibration Devices

Calibration Equipment Asset No.

Dead Weight Set:
HighLevel Board:
LowLevel Board:
Standard Asset No.: 16264
DW Compensation:
DMM: 17206
Digital Indicator: 17200
Lower Limit: 1.7793 kN
Temperature Readout: 18377
Additional Equipment:
Standardizer: 13102

Conditions

Ambient Temperature: 75.20 °F
Polarity(+): Tension
Bidirectional:
Cable Length: 100 Feet

In Tolerance	X	**As Found:**	X	**Tolerance: +/-1.0% of Applied Force**
Out of Tolerance		**As Adjusted:**		**As Found System Condition:** Good

Conditioner Parameters

Excitation: 9.5020
Delta K: 0.9997
Zero Offset: 0.0000
Multiplier:
Cal Res: 49.9 kohms
Shunt Cal: Positive: 40.407 Negative: -40.431
Range Gain:
PreAmp Gain: 64
Post Amp/FineGain: 7.5293
Polarity:

Calibration Data

Compression Range: 1
Resolution: 0
Full Scale: 50
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	0.0024	0.0000	0.00	0.0024	0.00
-20	-9.9955		0.0045	-0.05		
-40	-19.9980		0.0020	-0.01		
-60	-29.9990		0.0010	0.00		
-80	-39.9990		0.0010	0.00		
-100	-50.0040		0.0040	0.01		

Tension Range: 1
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	0.0020	0.0000	0.00	0.0020	0.00
20	9.9998		0.0002	0.00		
40	20.0010		0.0010	0.00		
60	30.0040		0.0040	0.01		
80	40.0050		0.0050	0.01		
100	50.0030		0.0030	0.01		

Errors at Zero are computed in % of Range.
The resolution of this Data Set is reflected in the least significant digit reported.
Transducer preloaded at both ends to 115% of full scale capacity.
MTS Calibration Laboratory force measurement expanded uncertainty (U): ±0.25% of applied force
U is calculated using a coverage factor (k) of 2.0, for an estimated confidence probability of 95%.

Out of Tolerance in % column

Notes: Range 1

Performed By: Eric Hogendorf
Date: 22-Dec-06

Signature:

ACSCLRep-CalLab Rev B.
JMG 5-8-2007

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290

Calibration Report

Customer Name: Magnetto Wheels Spa

Report Number: 5064-232975

System: 20 kip

Site: 33068

System ID:

Location: MTS Cal Lab

Equipment

Device Type: Force Model: 661.20E-01 Serial No.: 232975

Controller/Conditioner Model: 497.22 Serial No.: 0313282

Readout Device Model: 497.22 Serial No.: 0313282 Channel: T1

Procedure

MTS Procedure: Cal-Lab Calibration ACS Version: 5.23.02b

Calibration has been performed in accordance with: 1479

Method of Verification: Set-the-Force Method using Elastic Calibration Devices

Calibration Equipment Asset No.

Dead Weight Set: HighLevel Board: LowLevel Board: Standard Asset No.: 11966

DW Compensation: DMM: 17206 Digital Indicator: 17200 Lower Limit: .81073 kN

Temperature Readout: 18377 Additional Equipment: Standardizer: 13102

Conditions

Ambient Temperature: 75.30 °F Polarity(+): Compression Bidirectional: Cable Length: 100 Feet

In Tolerance	X	**As Found:**	X	**Tolerance: +/-1.0% of Applied Force**
Out of Tolerance		**As Adjusted:**		**As Found System Condition:** Good

Conditioner Parameters

Excitation: 9.5020 Delta K: 1.0004 Zero Offset: 0.0000 Multiplier: Cal Res: 49.9 kohms

Shunt Cal: Positive: 20.757 Negative: -20.729 Range Gain: PreAmp Gain: 64 Post Amp/FineGain: 7.73193 Polarity:

Calibration Data Range: 1

Compression Resolution: 0 Full Scale: 25

Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	-0.0015	0.0000	0.00	0.0015	-0.01
20	4.9981		0.0019	-0.04		
40	9.9956		0.0044	-0.04		
60	14.9990		0.0010	-0.01		
80	20.0010		0.0010	0.00		
100	25.0040		0.0040	0.02		

Tension Range: 1

Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	0.0024	0.0000	0.00	0.0024	0.01
-20	-4.9988		0.0012	-0.02		
-40	-10.0010		0.0010	0.01		
-60	-15.0040		0.0040	0.03		
-80	-20.0040		0.0040	0.02		
-100	-25.0070		0.0070	0.03		

Errors at Zero are computed in % of Range.

The resolution of this Data Set is reflected in the least significant digit reported.

Transducer preloaded at both ends to 115% of full scale capacity.

MTS Calibration Laboratory force measurement expanded uncertainty (U): ±0.25% of applied force

U is calculated using a coverage factor (k) of 2.0, for an estimated confidence probability of 95%.

Out of Tolerance in % column

Notes: Range 1

Performed By: Eric Hogendorf Date: 22-Dec-06

Signature:

ACSCLRep-CalLab Rev B.
JMG 5-8-2007

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290

Calibration Report

Report Number: 5064-233991
Site: 33068

Customer

Name: Magnetto Wheels Spa

System: 20 kip
System ID:
Location: MTS Cal Lab

Equipment

Device Type: Force
Model: 661.20E-01
Serial No.: 233991
Controller/Conditioner Model: 497.22
Serial No.: 0313282
Readout Device Model: 497.22
Serial No.: 0313282
Channel: T2

Procedure

MTS Procedure: Cal-Lab Calibration
ACS Version: 5.23.02b
Calibration has been performed in accordance with: 1479
Method of Verification: Set-the-Force Method using Elastic Calibration Devices

Calibration Equipment Asset No.

Dead Weight Set:
HighLevel Board:
LowLevel Board:
Standard Asset No.: 11966
DW Compensation:
DMM: 17206
Digital Indicator: 17200
Lower Limit: .81073 kN
Temperature Readout: 18377
Additional Equipment:
Standardizer: 13102

Conditions

Ambient Temperature: 76.00 °F
Polarity(+): Compression
Bidirectional:
Cable Length: 100 Feet

In Tolerance	X	**As Found:**	X
Out of Tolerance		**As Adjusted:**	

Tolerance: +/-1.0% of Applied Force
As Found System Condition: Good

Conditioner Parameters

Excitation: 9.5020
Delta K: 1.0009
Zero Offset: 0.0000
Multiplier:
Cal Res: 49.9 kohms
Shunt Cal: Positive: 20.577 Negative: -20.611
Range Gain:
PreAmp Gain: 64
Post Amp/FineGain: 7.64404
Polarity:

Calibration Data

Compression
Range: 1
Resolution: 0
Full Scale: 25
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	0.0015	0.0000	0.00	0.0006	-0.01
20	5.0006		0.0001	0.01		
40	9.9997		0.0000	0.00		
60	15.0030		0.0002	0.02		
80	20.0000		0.0010	0.00		
100	25.0030		0.0000	0.01		

Tension
Range: 1
Report Units: kN

Applied Percent of Full Scale Force	Series 1 Indicated Reading Ascending	Series 1 Indicated Reading Descending	Series 1 Errors Units Error Asc	Series 1 Errors Percent Error Asc	Series 1 Errors Units Error Desc	Series 1 Errors Percent Error Desc
0	0.0000	0.0010	0.0000	0.00	0.0006	0.01
-20	-4.9949		0.0000	-0.10		
-40	-9.9969		0.0004	-0.03		
-60	-14.9940		0.0020	-0.04		
-80	-19.9950		0.0032	-0.02		
-100	-24.9960		0.0020	-0.02		

Errors at Zero are computed in % of Range.
The resolution of this Data Set is reflected in the least significant digit reported.
Transducer preloaded at both ends to 115% of full scale capacity.
MTS Calibration Laboratory force measurement expanded uncertainty (U): ±0.25% of applied force
U is calculated using a coverage factor (k) of 2.0, for an estimated confidence probability of 95%.

Out of Tolerance in % column

Notes: Range 1

Performed By: Eric Hogendorf

Date: 26-Dec-06

Signature:

ACSCLRep-CalLab Rev B.
JMG 5-8-2007

MTS Systems Corporation Certificate of Calibration: Y.rpt
Date Report Created: Apr-18-2007 03:26:04 PM

Customer Name:	Magnetto
System Number:	33068
Serial Number:	
Operator Name:	R. Cesafsky
Calibration Date:	4-7-07
Transducer Model:	
Units:	mm
Calibration Equipment Info:	Asset 124
Maximum Range:	425.000000
Minimum Range:	-175.000000
Accuracy Spec(+-):	0.500000
Calibrated Scale:	0.010591
Calibrated Offset:	-299.061981
Calibrated Zero Offset:	0.000000
Maximum Error:	0.100567
Minimum Error:	-0.113036

Data Point	Reference	Cal Standard	Raw Value	Corrected	Error
1	0.000000	0.000000	28247.402344	0.100567	0.100567
2	50.000000	46.360001	32624.300781	46.455429	0.095430
3	100.000000	92.730003	36998.000000	92.776405	0.046408
4	150.000000	139.110001	41371.800781	139.098450	-0.011545
5	200.000000	185.429993	45746.898438	185.434219	0.004220
6	250.000000	231.770004	50121.300781	231.762634	-0.007367
7	300.000000	278.140015	54496.300781	278.097382	-0.042633
8	350.000000	324.500000	58870.699219	324.425751	-0.074235
9	400.000000	370.730011	63245.203125	370.755249	0.025247
10	-50.000000	-46.299999	23872.902344	-46.228878	0.071120
11	-100.000000	-92.440002	19498.900391	-92.553040	-0.113036
12	-140.000000	-139.929993	15016.600586	-140.024170	-0.094177

MTS Systems Corporation Certificate of Calibration: VD.rpt
Date Report Created: May-14-2007 01:28:17 PM

Customer Name:	Magnetto
System Number:	33068
Serial Number:	
Operator Name:	R. Cesafsky
Calibration Date:	3-15-07
Transducer Model:	
Units:	rpm
Calibration Equipment Info:	Asset 16323
Maximum Range:	800.000000
Minimum Range:	-800.000000
Accuracy Spec(+-):	1.000000
Calibrated Scale:	1.450540
Calibrated Offset:	4.540400
Calibrated Zero Offset:	0.000000
Maximum Error:	0.541594
Minimum Error:	-0.446908

Data Point	Reference	Cal Standard	Raw Value	Corrected	Error
1	0.000000	0.000000	-2.841273	0.419020	0.419020
2	100.000000	100.099998	65.570541	99.653091	-0.446908
3	200.000000	200.100006	134.673599	199.889847	-0.210156
4	300.000000	300.000000	203.610336	299.885345	-0.114669
5	400.000000	399.700012	272.795807	400.241608	0.541594
6	500.000000	500.100006	341.499054	499.898438	-0.201567
7	600.000000	600.099976	410.626556	600.170593	0.070610
8	700.000000	699.599976	479.113129	699.513123	-0.086853
9	800.000000	799.400024	547.994934	799.428955	0.028930

MTS Systems Corporation Certificate of Calibration: TB.rpt
Date Report Created: May-15-2007 09:12:51 AM

Customer Name:	Magnetto
System Number:	33068
Serial Number:	
Operator Name:	R. Cesafsky
Calibration Date:	5-16-07
Transducer Model:	
Units:	deg C
Calibration Equipment Info:	DVM Asset # 14509
Maximum Range:	500.000000
Minimum Range:	0.000000
Accuracy Spec(+-):	1.000000
Calibrated Scale:	0.000122
Calibrated Offset:	0.259679
Calibrated Zero Offset:	0.000000
Maximum Error:	0.095519
Minimum Error:	-0.104548

Data Point	Reference	Cal Standard	Raw Value	Corrected	Error
1	0.000000	1.100000	6999.998047	1.114348	0.014348
2	100.000000	101.099998	826000.000000	101.110580	0.010579
3	200.000000	201.100006	1645400.000000	201.155655	0.055653
4	300.000000	301.000000	2462299.750000	300.895447	-0.104548
5	400.000000	401.000000	3281601.000000	400.928436	-0.071551
6	500.000000	501.000000	4102000.000000	501.095520	0.095519

Honeywell

Honeywell
Sensotec Sensors
2080 Arlingate Lane
Columbus, Ohio 43228 U.S.A.

Phone: 614-850-5000
Fax: 614-850-1111
URL: http://www.sensotec.com
E-mail: service@sensotec.com

Certificate of Calibration

562804

Product Identification

Product Type: Pressure Transducer
Serial Number: 1135506

Model: TJE
Part Number: 060-0743-03TJG
Order Code: AP121DN

Product Specifications

Full Scale Range: 3000 psi
Calibrated At: 3000 psi
GAGE Pressure

Excitation: 10 VDC
Input Impedance: 402 Ω
Output Impedance: 352 Ω
Electrical Leakage: ∞ MegΩ

Calibration Data

Calibration Factor: 3.0006 mV/V

Shunt Cal Factor: 1.4909 mV/V
Shunt Cal Resistor: 59kΩ

Wiring Code

UNAMP#2,4-COND,6-PIN

PIN	DESIGNATION
A	(+)EXCITATION
B	(+)EXCITATION
C	(-)EXCITATION
D	(-)EXCITATION
E	(-)OUTPUT
F	(+)OUTPUT

001-0333-02

Certification Information

Type of Calibration: Standard
Calibration Date: 11/15/2006

Certificate Number: 086-0000-00
Calibration Procedure: 072-FP75-23

Notes: Instruments used in the calibration of this product have been calibrated to standards traceable to the National Institute of Standards and Technology (NIST). A calibration uncertainty ratio of 4:1 has been maintained unless otherwise stated.

If you have any questions concerning this certificate of calibration, or for recalibration or repair of this product, please visit our website at ***http://www.sensotec.com/service.htm*** *or call our service department at (614) 850-5000.*

This is a quality record.

Approved and Certified By: Eszter Gozon

Eszter Gozon, Quality Manager

Printed: 11/16/2006

497 Calibration Report File: m497chassis_1.4rp
Report Generated On: Jul-17-2007 10:03:33 AM

Module Name: DDCC_Fy
Chassis Number: 1
Slot Address: 1
Module Type: 6
Channel: 1
Filter: Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain: 64
Preamp Input Selection: Inverted
Conditioner Output: Transducer Feedback
Auxiliary Signal Selection: - Excitation
Front Tip Jack Output: Transducer Feedback
Hydraulics: OFF
Interlock Limits: Enabled
Interlock Lockout: Disabled
Hydraulic Lockout: Disabled
Excitation: 9.5043
Post Amp Gain: 7.6075
Zero Offset: -0.0000
Lower Limit: -10.5029
Upper Limit: 10.5030
Bridge Balance: 0.0391
Bus A Monitor: Disabled
Bus B Monitor: Disabled
USER AD: 0

Module Name: DDCC_Fz
Chassis Number: 1
Slot Address: 1
Module Type: 6
Channel: 2
Filter: Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain: 64
Preamp Input Selection: Normal
Conditioner Output: Transducer Feedback
Auxiliary Signal Selection: + Excitation
Front Tip Jack Output: Transducer Feedback
Hydraulics: OFF
Interlock Limits: Enabled
Interlock Lockout: Disabled
Hydraulic Lockout: Disabled
Excitation: 9.5043
Post Amp Gain: 7.5293
Zero Offset: 0.0132
Lower Limit: -10.5029

```
Upper Limit:          10.5030
Bridge Balance:        0.0000
Bus A Monitor:   Disabled
Bus B Monitor:   Disabled
USER AD:    0


Module Name:     DDCC_Wt 1
Chassis Number: 1
Slot Address:    2
Module Type:     6
Channel:    1
Filter:     Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain:    64
Preamp Input Selection:     Normal
Conditioner Output:   Transducer Feedback
Auxiliary Signal Selection:      + Excitation
Front Tip Jack Output:     Transducer Feedback
Hydraulics:      OFF
Interlock Limits:     Enabled
Interlock Lockout:    Disabled
Hydraulic Lockout:    Disabled
Excitation:           9.5043
Post Amp Gain:        7.7320
Zero Offset:          0.7700
Lower Limit:        -10.5029
Upper Limit:         10.5030
Bridge Balance:       0.0440
Bus A Monitor:   Disabled
Bus B Monitor:   Disabled
USER AD:    0


Module Name:     DDCC_Wt 2
Chassis Number: 1
Slot Address:    2
Module Type:     6
Channel:    2
Filter:     Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain:    64
Preamp Input Selection:     Normal
Conditioner Output:   Transducer Feedback
Auxiliary Signal Selection:      + Excitation
Front Tip Jack Output:     Transducer Feedback
Hydraulics:      OFF
Interlock Limits:     Enabled
Interlock Lockout:    Disabled
Hydraulic Lockout:    Disabled
Excitation:           9.5043
Post Amp Gain:        7.6441
Zero Offset:         -0.0659
```

Lower Limit: -10.5029
Upper Limit: 10.5030
Bridge Balance: 0.1489
Bus A Monitor: Disabled
Bus B Monitor: Disabled
USER AD: 0

Module Name: DDCC_Pt
Chassis Number: 1
Slot Address: 3
Module Type: 6
Channel: 1
Filter: Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain: 1
Preamp Input Selection: Ground
Conditioner Output: Analog Ground
Auxiliary Signal Selection: + Excitation
Front Tip Jack Output: Analog Ground
Hydraulics: OFF
Interlock Limits: Disabled
Interlock Lockout: Disabled
Hydraulic Lockout: Disabled
Excitation: 0.0000
Post Amp Gain: 0.0000
Zero Offset: -0.0000
Lower Limit: -15.0000
Upper Limit: 464.9947
Bridge Balance: -4.9097
Bus A Monitor: Disabled
Bus B Monitor: Disabled
USER AD: 0

Module Name: DDCC_Pb
Chassis Number: 1
Slot Address: 3
Module Type: 6
Channel: 2
Filter: Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain: 64
Preamp Input Selection: Normal
Conditioner Output: Transducer Feedback
Auxiliary Signal Selection: + Excitation
Front Tip Jack Output: Transducer Feedback
Hydraulics: OFF
Interlock Limits: Enabled
Interlock Lockout: Disabled
Hydraulic Lockout: Disabled
Excitation: 10.0024
Post Amp Gain: 5.2002

```
Zero Offset:          0.0039
Lower Limit:        -10.5029
Upper Limit:          9.9977
Bridge Balance:       0.0000
Bus A Monitor:  Disabled
Bus B Monitor:  Disabled
USER AD:   0


Module Name:     DDCC_Mx 1
Chassis Number: 1
Slot Address:    4
Module Type:     6
Channel:   1
Filter:    Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain:   64
Preamp Input Selection:    Inverted
Conditioner Output:  Transducer Feedback
Auxiliary Signal Selection:     + Excitation
Front Tip Jack Output:     Transducer Feedback
Hydraulics:     OFF
Interlock Limits:     Enabled
Interlock Lockout:    Disabled
Hydraulic Lockout:    Disabled
Excitation:           9.5043
Post Amp Gain:        7.6465
Zero Offset:          0.0229
Lower Limit:        -10.5029
Upper Limit:         10.5030
Bridge Balance:       0.0000
Bus A Monitor:  Disabled
Bus B Monitor:  Disabled
USER AD:   0


Module Name:     DDCC_Mx 2
Chassis Number: 1
Slot Address:    4
Module Type:     6
Channel:   2
Filter:    Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain:   64
Preamp Input Selection:    Inverted
Conditioner Output:  Transducer Feedback
Auxiliary Signal Selection:     + Excitation
Front Tip Jack Output:     Transducer Feedback
Hydraulics:     OFF
Interlock Limits:     Enabled
Interlock Lockout:    Disabled
Hydraulic Lockout:    Disabled
Excitation:           9.5043
```

Post Amp Gain: 7.7661
Zero Offset: 0.0088
Lower Limit: -10.5029
Upper Limit: 10.5030
Bridge Balance: 0.0000
Bus A Monitor: Disabled
Bus B Monitor: Disabled
USER AD: 0

Module Name: DDCC_Fy Cal
Chassis Number: 1
Slot Address: 5
Module Type: 6
Channel: 1
Filter: Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain: 64
Preamp Input Selection: Inverted
Conditioner Output: Transducer Feedback
Auxiliary Signal Selection: + Excitation
Front Tip Jack Output: Transducer Feedback
Hydraulics: OFF
Interlock Limits: Disabled
Interlock Lockout: Disabled
Hydraulic Lockout: Disabled
Excitation: 9.4994
Post Amp Gain: 7.7173
Zero Offset: 0.0161
Lower Limit: -11.0010
Upper Limit: 11.0011
Bridge Balance: 0.0000
Bus A Monitor: Disabled
Bus B Monitor: Disabled
USER AD: 0

Module Name: DDCC_Fz Cal
Chassis Number: 1
Slot Address: 5
Module Type: 6
Channel: 2
Filter: Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain: 64
Preamp Input Selection: Normal
Conditioner Output: Transducer Feedback
Auxiliary Signal Selection: + Excitation
Front Tip Jack Output: Transducer Feedback
Hydraulics: OFF
Interlock Limits: Disabled
Interlock Lockout: Disabled
Hydraulic Lockout: Disabled

Excitation: 9.4994
Post Amp Gain: 7.5830
Zero Offset: 0.0019
Lower Limit: -11.0010
Upper Limit: 11.0011
Bridge Balance: 0.0000
Bus A Monitor: Disabled
Bus B Monitor: Disabled
USER AD: 0

Module Name: DDCC_Accel
Chassis Number: 1
Slot Address: 6
Module Type: 6
Channel: 1
Filter: Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain: 8
Preamp Input Selection: Normal
Conditioner Output: Transducer Feedback
Auxiliary Signal Selection: + Excitation
Front Tip Jack Output: Transducer Feedback
Hydraulics: OFF
Interlock Limits: Disabled
Interlock Lockout: Disabled
Hydraulic Lockout: Disabled
Excitation: 14.9988
Post Amp Gain: 8.0005
Zero Offset: 0.2768
Lower Limit: -10.5029
Upper Limit: 10.5030
Bridge Balance: 0.0000
Bus A Monitor: Disabled
Bus B Monitor: Disabled
USER AD: 0

Module Name: DDCC_N/A
Chassis Number: 1
Slot Address: 6
Module Type: 6
Channel: 2
Filter: Disabled
Neg Shunt: Disabled
Pos Shunt: Disabled
Pre-amp Gain: 1
Preamp Input Selection: Ground
Conditioner Output: Analog Ground
Auxiliary Signal Selection: + Excitation
Front Tip Jack Output: Analog Ground
Hydraulics: OFF
Interlock Limits: Disabled
Interlock Lockout: Disabled

MW LAB MW Italia	**VERIFICA CELLE DI CARICO** **RULLO BIASSIALE MTS** matr. MR 025	Istruzioni verifica MTS "100021446C_ calibrazione pp 139 158

Channel Fz

Cella campione:		
Serial No.:	**252321**	
Full scale:	50.000	N
Costruttore	MTS	

Cella in esame:			
Serial No.:	**252322**		
Full scale:	50.000		N
Costruttore	MTS		
Calibr. precedente	Offset	K	dal
	0	0,9997	22/12/2006

TRAZIONE

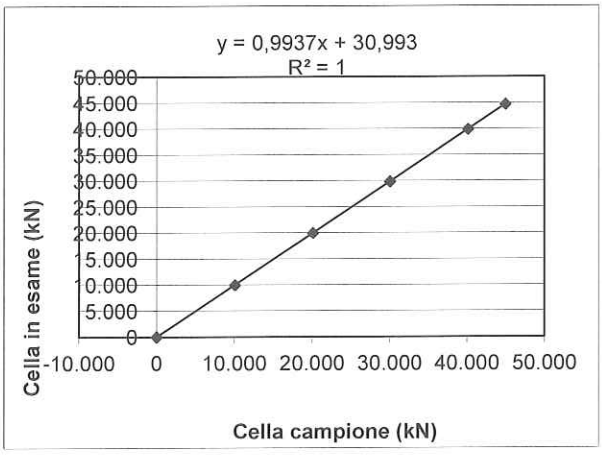
Percentuale fondo scala	Valore di riferimento	Valore cella MTS	Valore cella campione	Errore ass
%	N	N	N	%
0	0	-22	30	0,5
20	10.000	10.063	10.000	**0,6**
40	20.000	20.080	19.983	0,5
60	30.000	30.003	29.852	0,5
80	40.000	40.103	39.891	0,5
90	45.000	44.945	44.686	0,6

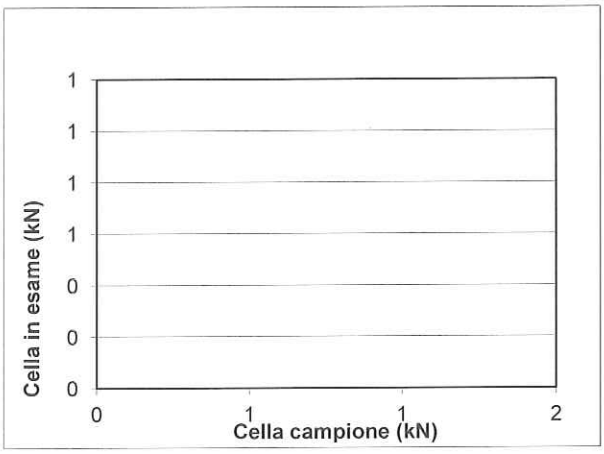
Errore max 0,6 %

COMPRESSIONE

Percentuale fondo scala	Valore di riferimento	Valore cella MTS	Valore cella campione	Errore ass
%	N	N	N	%
0	0			0,0
-20	-10.000			**0,0**
-40	-20.000			**0,0**
-60	-30.000			**0,0**
-80	-40.000			**0,0**
-90	-45.000			**0,0**
-100	-50.000			

Errore max 0,0 %





Calibrazione attuale in caso di err >=2 %	Offset	K

In caso di calibrazione occorre eseguire nuova verifica

Considerazioni

La verifica è POSITIVA, non occorre eseguire la calibrazione

ESITO	DATA	OPERATORE	VISTO
POSITIVO	23/07/2013	F.GATTO	L.LORENZETTI

MW LAB MW Italia	VERIFICA CELLE DI CARICO RULLO BIASSIALE MTS matr. MR 025	Istruzioni verifica MTS "100021446C_ calibrazione pp 139 158

Channel Fz

Cella campione:		
Serial No.:	250092	
Full scale:	25.000	N
Costruttore	MTS	

Cella in esame:			
Serial No.:	233992		
Full scale:	25.000		N
Costruttore	MTS		
Calibr. precedente	Offset	K	dal
	0	1,0005	26/12/2006

TRAZIONE

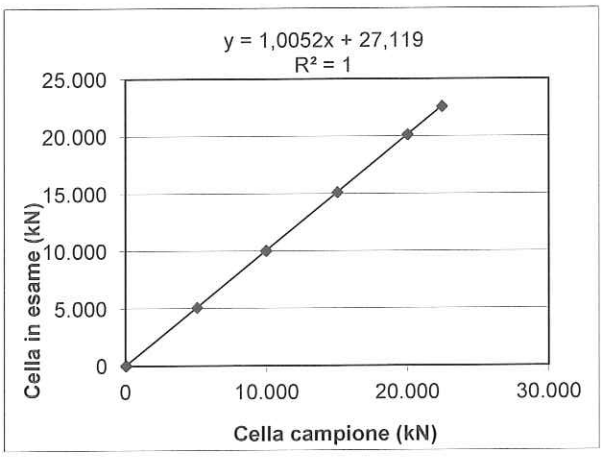
Percentuale fondo scala	Valore di riferimento	Valore cella MTS	Valore cella campione	Errore ass
%	N	N	N	%
0	0	23	41	0,4
20	5.000	5.043	5.093	**1,0**
40	10.000	9.945	10.040	1,0
60	15.000	15.000	15.115	0,8
80	20.000	20.005	20.137	0,7
100	25.000	22.455	22.587	0,5

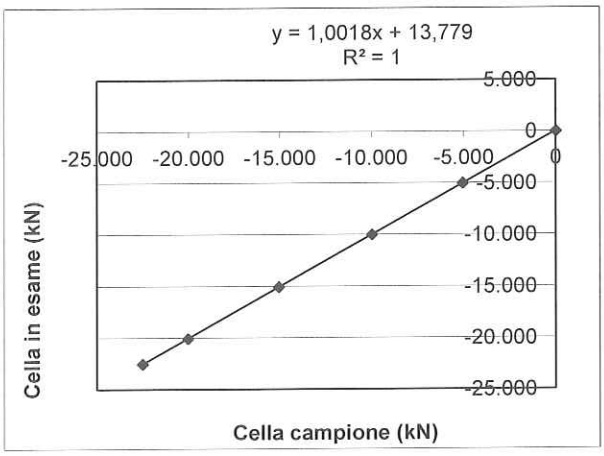
Errore max 1,0 %

COMPRESSIONE

Percentuale fondo scala	Valore di riferimento	Valore cella MTS	Valore cella campione	Errore ass
%	N	N	N	%
0	0	0	0	0,0
-20	-5.000	-5.050	-5.026	**0,5**
-40	-10.000	-9.994	-10.003	0,1
-60	-15.000	-15.069	-15.076	0,0
-80	-20.000	-20.041	-20.073	0,2
-90	-22.500	-22.511	-22.537	0,1
-100	-25.000			

Errore max 0,5 %





Calibrazione attuale in caso di err >=2 %	Offset	K

In caso di calibrazione occorre eseguire nuova verifica

Considerazioni

La verifica è POSITIVA, non occorre eseguire la calibrazione

ESITO	DATA	OPERATORE	VISTO
POSITIVO	23/07/2013	F.GATTO	L.LORENZETTI

MW LAB MW Italia	VERIFICA CELLE DI CARICO RULLO BIASSIALE MTS matr. MR 025	Istruzioni verifica MTS "100021446C_ calibrazione pp 139 158

Channel MX1

Cella campione:		
Serial No.:	**Sk 211**	
Full scale:	100.000	N
Costruttore	CCT Italia	

Cella in esame:			
Serial No.:	**251432**		
Full scale:	100.000		N
Costruttore	MTS		
Calibr. precedente	Offset	K	dal
	0	1,0003	22/12/2006

TRAZIONE

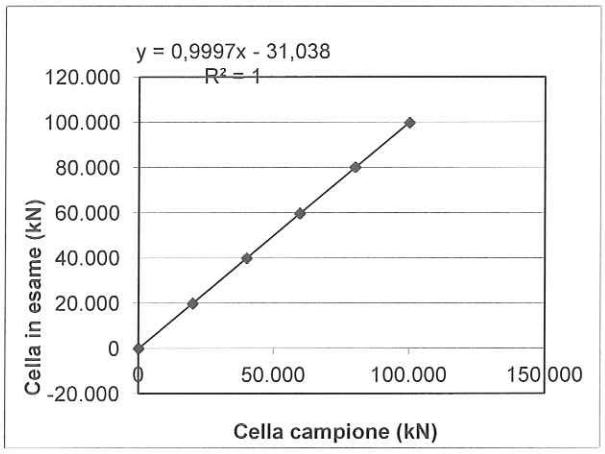
Percentuale fondo scala	Valore di riferimento	Valore cella MTS	Valore cella campione	Errore ass
%	N	N	N	%
0	0	0	0	0,0
20	20.000	19.993	19.893	**0,5**
40	40.000	39.994	39.894	0,3
60	60.000	59.699	59.702	0,0
80	80.000	80.010	80.102	0,1
100	100.000	100.020	99.837	0,2

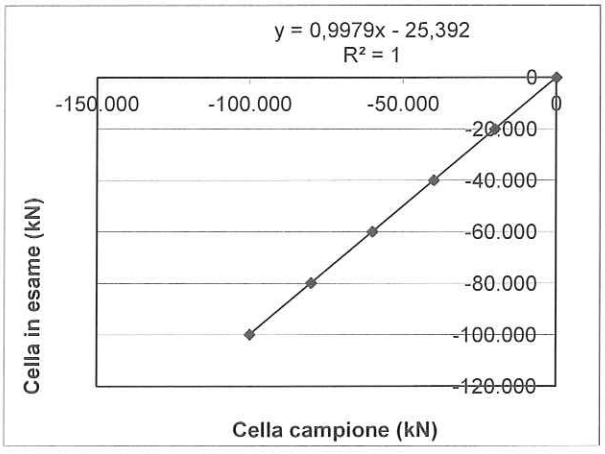
Errore max 0,5 %

COMPRESSIONE

Percentuale fondo scala	Valore di riferimento	Valore cella MTS	Valore cella campione	Errore ass
%	N	N	N	%
0	0	0	0	0,0
-20	-20.000	-20.017	-20.058	0,2
-40	-40.000	-40.000	-39.941	0,1
-60	-60.000	-60.006	-59.886	0,2
-80	-80.000	-80.000	-79.812	**0,2**
-100	-100.000	-99.996	-99.858	0,1

Errore max 0,2 %





Calibrazione attuale in caso di err >=2 %	Offset	K

In caso di calibrazione occorre eseguire nuova verifica

Considerazioni

La verifica è POSITIVA, non occorre eseguire la calibrazione

ESITO	DATA	OPERATORE	VISTO
POSITIVO	23/07/2013	F.GATTO	L.LORENZETTI

MW LAB MW Italia	VERIFICA CELLE DI CARICO RULLO BIASSIALE MTS matr. MR 025	Istruzioni verifica MTS "100021446C_ calibrazione pp 139 158

Channel MX2

Cella campione:		
Serial No.:	**Sk 211**	
Full scale:	100.000	N
Costruttore	CCT Italia	

Cella in esame:			
Serial No.:	**241444**		
Full scale:	100.000		N
Costruttore	MTS		
Calibr. precedente	Offset	K	dal
	0	0,9998	22/12/2006

TRAZIONE

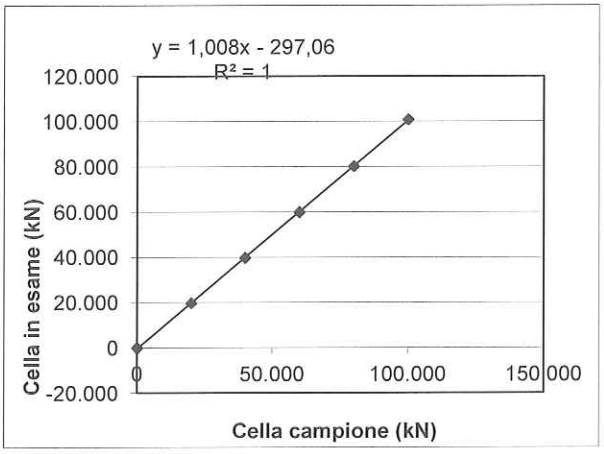
Percentuale fondo scala	Valore di riferimento	Valore cella MTS	Valore cella campione	Errore ass
%	N	N	N	%
0	0	0	0	0,0
20	20.000	19.998	19.793	**1,0**
40	40.000	39.998	39.794	0,5
60	60.000	59.999	59.989	0,0
80	80.000	80.001	80.215	0,3
100	100.000	100.020	100.856	0,8

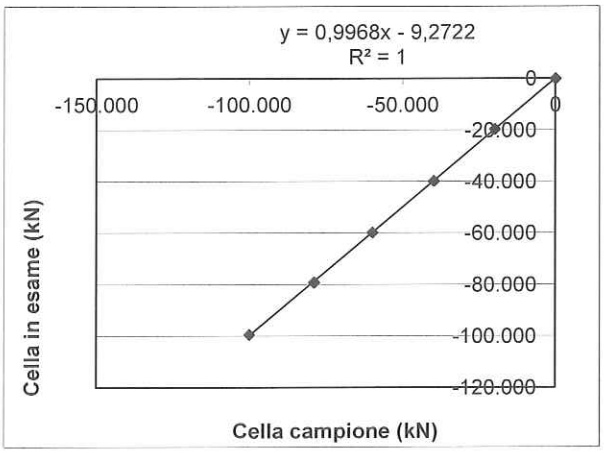
Errore max 1,0 %

COMPRESSIONE

Percentuale fondo scala	Valore di riferimento	Valore cella MTS	Valore cella campione	Errore ass
%	N	N	N	%
0	0	0	0	0,0
-20	-20.000	-19.845	-19.658	**0,9**
-40	-40.000	-39.910	-39.844	0,2
-60	-60.000	-59.978	-59.773	0,3
-80	-80.000	-78.987	-79.182	0,2
-100	-100.000	-100.103	-99.463	0,6

Errore max 0,9 %





Calibrazione attuale in caso di err >=2 %	Offset	K

In caso di calibrazione occorre eseguire nuova verifica

Considerazioni

La verifica è POSITIVA, non occorre eseguire la calibrazione

ESITO	DATA	OPERATORE	VISTO
POSITIVO	23/07/2013	F.GATTO	L.LORENZETTI