REGIONE BASILICATA

Provincia MATERA

COMUNE DI ALIANO (MT)

PROGETTO DEFINITIVO RELATIVO ALLA REALIZZAZIONE DI UN IMPIANTO EOLICO COSTITUITO DA 6 AEROGENERATORI E DALLE RELATIVE OPERE DI CONNESSIONE ALLA R.T.N.

RELAZIONE ANEMOLOGICA

ELABORATO

A.5

PROPONENTE:

Statkraft

SKI 04 s.r.l.
via Caradosso n.9
Milano 20123
P.Iva 11479190966

CONSULENZA:

PROGETTO E SIA:

ATECH SOCIETÀ DI INGEGNERIA & SERVIZI PER L'INGEGNERIA

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Via Caduti di Nassiryia, 55
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pec: atechsrl@legalmail.it
Ing. Alessandro Antezza

ORDINE DEGLI INGEGNERI PROVINCIA DI BARI
INGEGNERE
Alessandro Antezza
Sez. A - 10743
a) CIVILE ED AMBIENTALE
b) INDUSTRIALE
c) DELL'INFORMAZIONE

Il DIRETTORE TECNICO
Ing. Orazio Tricarico

ORDINE DEGLI INGEGNERI PROVINCIA DI BARI
INGEGNERE
ORAZIO TRICARICO
Sez. A - 4985
a) CIVILE AMBIENTALE
b) INDUSTRIALE
c) dell' INFORMAZIONE

SOLARITES RENEWABLE ENERGY

SOLARITES s.r.l.
piazza V.Emanuele II n.14
Ceva (CN) 12073

0	LUGLIO 2022	B.C.C	A.A. - O.T.	A.A. - O.T.	*Progetto Definitivo*
EM./REV.	DATA	REDATTO	VERIFICATO	APPROVATO	DESCRIZIONE

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6WXGLR DQHPRORJLFR H SURHOLPLQDUH 9DORXWLF]LRQH GHOOD 3URGX]LRQH (

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9HULILFD GHOO¶DSSURVVLPD]LRQH GHOOD FXUYD GL :HLEXOO

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$QDOLVL GLWUL QFHUR

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9 *$OOHJDWR $ 5LVXOWDWL GHOO¶LQGDJLQH GHOOD PHVRVFDOD VHQWLWD ...*
OXQJR SHULRGR

6HGH /HJDOH
9LD 0DWWHRWWL 3DUGR 9DO 7URPSLD %6
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/D SRVVLELOLWj GL XWLOL]]DUH ... GLVSRQLELOLWj GL VLWL FRQ FDUDWWHULVWLFKH ... ULDVVXPRQR QHOOD GLVSRQLELOLWj ... QHOO DFFHVVLELOLWj DO VLWR ... DVVRUELUH OD TXRWD LPPLVVLRQH GL ... O DFFHWWDELOLWj SXEEOLFD GHOO ...

2JJHWWR GHO SUHVHQWH VWXGLR UHDOL]]DWR ... FDUDWWHUL]]D]LRQH DQHPRORJLFD ... DWWHVD GL XQ LPSLDQWR HROLFR ... 0DWHUD 5HJLRQH %DVLOLFDWD ... PLVXUD QHO SURVVLPLWj GHQRPLQDWD ... DSSDUWHQHQWL DOOD SL• DPSLD DUHD FRQVLGHUDWD

,Q VLQWHVL O¶DWWLYLWj VYROWD ... VL DUWLFROD QHOOH VHJXHQWL IDVL:

$QDOLVL YDOLGD]LRQH HG HODERUD]LRQH ...

3UHGLVSRVL]LRQH GHOOD PDSSD WHU...

6LPXOD]LRQH GHO FDPSR GL YHQWR PHGLDQWH PRGHOOR :$V3

9DOXWD]LRQL GHOOD SURGX]LRQH DQQXD ... SHUGLWH VWLPDWH 3

9HULILFD GHO ULVSHWWR GHL UHTXLVLWL ... UHJLRQDOH

/D SUHVHQWH UHOD]LRQH ... VWD]LRQH 5,) XWLOL]]DWD ... UHJLRQDOH

7XWWD O¶DWWLYLWj q VWDWD VYROWD ... GDOOD PHWRGRORJLD GHILQLWD ... QRVWUD VRFLHWj /¶DSSOLFD]LRQH GHOOD ... FRRUGLQDWR GD ILJXUH FHUWLILFDWH ... VWHVVR

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,O VLWR LQ RJJHWWR VL WURYD QHO [illegible]
GHOOD 5HJLRQH %DVLOLFDWD

/¶DUHD JHRJUDILFD FKH OR RVSLWD [illegible]
PHGLDPHQWH FRPSOHVVD 1HO SDUWL[illegible]
LQ SURVVLPLWj GHO ULOLHYR FRO[illegible]
SURVVLPLWj GHOOR VWHVVR FKH SRVV[illegible]
SUHGRPLQDQWH FRPH IUHTXHQ]D ULV[illegible]
HQHUJHWLFR VRSUDWWXWWR GD 6XG 2YHVW

3HU TXDQWR ULJXDUGD OH FDUDWWHU[illegible]

- $OWLWXGLQH PHGLD [illegible]
- 2URJUDILD [illegible]PHQWH FRPSOHVVD
- 2URJUDILD FLUFR[illegible]RHVVD
- 8WLOL]]R GHO [illegible]QRFROWR

3HU LO VLWR LQ RJJHWWR VRQR VWD[illegible]
SXQWL DYHQWL XQD EXRQD HVSRVL]LR[illegible]

1HOO¶LQWRUQR GHOO¶DUHD GL LQVW[illegible]
HROLFL LQ HVHUFL]LR GD DOFXQL [illegible]
JLj ULWHQXWD LGRQHD SHU WDOH VI[illegible]
LQWHUIHUHQ]D DOO¶LPSLDQWR LQ SU[illegible]
VDWHOOLWDUL

6HGH /HJDOH
9LD 0DWWHRWWL [illegible] 9DO 7URSLD %6
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1HOOD WDEHOOD VRWWRVWDQWH VRQR ULSRUWDWL L ULVXOWDWL GHOOD VWLPD GHOOD SURGX]LRQH HQHUJHWLFD QHWWD SHU LO SURJHWWR ULFHYXWH GDO &RPPLWWHQWH LQ VHWWRUL DQQXDOL H FRRUGLQDWH 870 (' H *$866 %2$*$

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1HOOD WDEHOOD VRWWRVWDQWH VRQR LQROWUH ULSRUWDWH OH GLVWDQ]H WUD JOL DHURJHQHUDWRUL LQ PHWUL LQ DOWR D GHVWUD H LQ GLDPHWUL URWRUH LQ EDVVR D VLQLVWUD GDOOD WDEHOOD WXWWH OH SRVL]LRQL VRQR D GLVWDQ]D PDJJLRUH GL GLDPHWUL GL URWRUH WUD ORUR LQ VHWWRUH FRPSUHVR WUD FRQ VSHFLILFD

6HGH /HJDOH
9LD 0DWWHRWWL ±DUGRQH 9DO 7URPSLD %6
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3HU OD YDOXWD]LRQH GL SURGXFLELOLWj GHO VLWR q VWDWR VFHOWR O¶DHURJHQHUDWRUH 6* FRQ SRWHQ]D SDUL D 0: /D FXUYD GL SRWHQ]D GHOO¶DHURJHQHUDWRUH NJ P FRUULVSRQGHQWH DOOD TXRWD GL UHIHUHQ]D VYLOXSSR VLD OD FXUYD GL SRWHQ]D FKH OD FXUYD GHL FRHIILFLHQWL GL SHUGLWH SHU HIIHWWR VFLD

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, ULVXOWDWL FRQVHJXLWL GDOOD QHWWD VHULH GL GDWL GL YHQWR LQVWDOODWR VXOOD VWD]LRQH DQHPRPHWULFD 5,) VRQR RWWLPDPHQWH

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1HOO¶HODERUD]LRQH VRQR ULSRUWDWH LQIRUPD]LRQL GL VWDWLVWLFD GHL GDWL ULOHYDWL GDOOD VWD]LRQH LQ SDUWLFRODUH GRFXPHQWDWR VL FRP

- $ 5DFFROWD GHOOD GRFXPHQWD]LRQH WHFQLFD GHOOD VWD
- $ 7DEHOOH GHOOH GLVSRQLELOLWj HIIHWWLYH PHQVLOL
- $ 5LVXOWDWL GHOOH HODERUD]LRQL VWDWLVWLFKH GHL GDW

/D PLVXUD D P GDO VXROR SUHVHQWD XQD SHUFHQWXDOH GL PHVL LQ DFFRUGR DOOH QRUPDWLYH, LQ RJQL FDVR FRQVHJXHQ]D VL q GHFLVR GL XWLOL]]DUH XQD VHULH GL ULSRUWDQR OH WDEHOOH FRPSOHWH GHOOH VWDWLVWLFKH SULQFLS

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6HGH /HJDOH
9LD 0DWWHRWWL 7DUGROLQH 9DO 7URPSLD %6
&RG)LVF 3 ,9$
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,O FDPSR GL YHORFLWj GHO YHQWR [illegible]
GLVSRQLELOH VXOOD VXD VXSHUILFLH [illegible]
q UHDOL]]DWD SHU PH]]R GL XQ PRGHOOR [illegible]
WHUULWRULR DJLVFRQR GHOOH JUDQGH]]H [illegible]
VSHFLILFL PRGHOOL PDWHPDWLFL [illegible]
JHRJUDILFKH OD YHQWRVLWj VFDWXULVFH [illegible]

7XWWH OH HODERUD]LRQL OH [illegible]
FRGLFH R PRGHOOR GL FDOFROR :$V3 [illegible]
5LVRH 1DWLRQDO /DERUDWRU\ GL 'DQLPDUFD [illegible]

$ SDUWLUH GDOOD SRVL]LRQH VSD]LDOH [illegible]
VX WXWWD O¶DUHD GL LQWHUHVVH [illegible]
ULWLHQH FRVWDQWH SHU GLYHUVH [illegible]
VSD]LR WXWWL L SDUDPHWUL X [illegible]
WULGLPHQVLRQDOH H FLz FRQVHQWH [illegible]
DOWH]]H GDO VXROR

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3HU FRQIHULUH VXIILFLHQWH VWDELOLWj [illegible]
WULGLPHQVLRQDOH FRQ VXSHUILFLH [illegible]

,Q TXHVWR FDVR VL q XWLOL]]DWD [illegible]
[NP FRQ FXUYH GL OLYHOOR GH [illegible]
>'(0@ GHOO LQWHUR WHUULWRULR [illegible]
GLQWRUQL GHO VLWR H GHOOH VWD[illegible]
UXJRVLWj GHO WHUUHQR GHULYDWD GDO GDWDEDVH &RULQH /DQG

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'RYHQGR DJLUH DOO¶LQWHUQR GL XQ PRGHOOR YLVWR XWLOL]]DUH FULWLFDPHQWH SULPD GL LQWUDSUHQGHUH HVHFX]LRQH HL FDWWHUL VWLFKH PRGHOOR DEELDQR SURGRWWR XQ DPELHQWH GHVFULWWR WLHQH FRQWUROOR VLPXOD]LRQH

9HULILFD GHOO¶DSSURVVLPD]LRQH GHOOD FXUYD GL :HLEXOO

,O FRGLFH GL FDOFROR :$V3 XWLOL]]D O¶DSSURVVLPD]LRQH GL GHILQLVFH LO FDPSR GL YHQWR LQ GLVWULEX]LRQH GHOOD YHORFLWj DVVRFLDWD

5,) B7 ± 'LVWULEX]LRQH GHOOD YHORFLWj GHO YHQWR 5,

3HU OD VWD]LRQH OD GLVWULEX]LRQH GL :HLEXOO FDOFRODWD ULSRUWDWD QHOOD WDEHOOD VHJXHQWH GRYH

$ YHORFLWj FDUDWWHULVWLFD 9F HO FDPSR GL :HLEXOO
N IDWWRUH GL IRUPD N GL WDOH GLVWULEX]LRQH GL :HLEXOO
8 YDORUH PHGLR GHOOD YHORFLWj GHO YHQWR SHU FLDVFXQ
3 SRWHQ]D VSHFLILFD PHGLD IOXLGD QHO VHWWRUH GL GLUH]LRQH
I IUHTXHQ]D SHUFHQWXDOH GL RFFRUUHQ]D QHO VHWWRUH SHU

6HGH /HJDOH
9LD 0DWWHRWWL 9DO 7URPSLD %6
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,Q DOWR QHOOD SULPD SDUWH GL FRQIURQWR H DO
VSHULPHQWDOL 0HDVXUHG FRQ OD GHQVLWj GL SRWHQ]D

'L VHJXLWR L SDUDPHWUL VSHULPHQWDOL LQ
PRGHOOR FRPSUHQVLYL GHOOH LQIRUPD]LRQL
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/H GLVFUHSDQ]H ULVFRQWUDWH LQ
QHO SXQWR VSD]LDOH GHOO¶DQHPRP
FKH LQIOXLVFRQR PDJJLRUPHQWH VXO
FRQWHQXWH HG DOO¶LQWHUQR GHO
VWD]LRQH H VRSUDWWXWWR O¶RURJUDILD LQWHUFRUUHQWH SLXWW

6L SXz TXLQGL ULWHQHUH VRGGLVIDFHQWH OD YHULILFD SHU 5,

9HULILFD GHO JUDGLHQWH DO VXROR GHOOD YHORFLWj GHO YHQ

,O JUDGLHQWH DO VXROR GHOOD Y
YHORFLWj GHO YHQWR DOOH YDULH
DSSURVVLPD]LRQL FKH LO PRGHOOR
UHJLVWUDWR VXOOD YHUWLFDOH GHOOD VWD]LRQH

1HO FDVR VSHFLILFR QRQ GLVSRQHQGR
5LIHULPHQWR LO FRQIURQWR GHYH
QRUPDOPHQWH DWWHVL LQ UHOD]LRQ
VSHFLILFR q OHFLWR DWWHQGHUVL

/D YHULILFD YLHQH HIIHWWXDWD VXOO¶DOWH]]D GL PR]]R GL

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,O JUDGLHQWH DO VXROR VWLPDWR j GHDO PRGHOOR
DWWHVR GHWHUPLQDQGR XQR
VHQVLELOH VRWWRVWLPD QHOOD FRQ
SUHIHULELOH HVWUDSRODUH OD VH
FRQ DWWHJJLDPHQWR FDXWHODWLYR
,O SURFHVVR GHVFULWWR YHUUj FRPX

$QDOLVL GL PLFURVLWLQJ

4XDQGR SHU YDOXWDUH OD YHQWRVLWj
VWD]LRQL DQHPRPHWULFKH q SRVVLELOH
RWWHQXWH XWLOL]]DQGR DOWHUQDWLYD

1HO FDVR VSHFLILFR ROWUH D 5,)
TXDOL ROWUH DG HVVHUH UDSSUHVHQ
VLWR LQ SURJHWWR

$ VHJXLWR GL XQD SULPD YHULILFD
PLVXUDWH D TXHOOH VWLPDWH GD :$V3
FRQVLGHUDWH OH ULVXOWDQ]H QRQ
FDOFRODUH LO FDPSR GL YHQWR
SURYYHGXWR DG HVHJXLUH XQD VHFRQGD HODERUD]LRQH

6L HYLGHQ]LD FKH VROLWDPHQWH JOL
YHQWR VXOOD VWD]LRQH VWHVVD FKH
YDOXWD OD YHQWRVLWj GHOO¶DUHD
LQWHUFRUUHQWH

1HOOD VHFRQGD HODERUD]LRQH
VXROR GHOOD YHORFLWj GHO YHQWR
5,) SUHYLD VXD HVWUDSROD]LRQH
LQIHULRUH D TXHOOR DWWHVR
SHU LO FDVR VSHFLILFR WURSSR VRWWRVWLPDWR

1RQ GLVSRQHQGR GL PLVXUH
O¶LQWHQVLWj GHO YHQWR SHU HVWUDSRODUH
SDUDPHWUR GL JUDGLHQWH DO VXROR DOID

7DOH JUDQGH]]D q GHWHUPLQDELOH
GLIIHUHQWL DOWH]]H LQ DOWHUQDWLYD XWLOL]]DQGR
VSHFLILFR

/D UHOD]LRQH FKH SHUPHWWH GL VWLPDUH FRQ GDWH OD FLWj H G]HO ULSRUWDWD QHOOD VHJXHQWH IRUPXOD

GRYH *D* OD JUDGLHQWH GHOOD YHORFLWj GHO YHQWR GHOO VXRORUR UL VXRO PHQWH UHO¶DOWH]]D DOOD TXDOH FDOFRODUH LO YHQWR

,O ULVXOWDWR ILQDOH GL WDOH SURFHVVR q TXL ULDVVXQWR

5,) B++						

GLVWULEX]LRQ

3HU OH DOWUH VHULH GL GDWL XWLOL SUHWWH QHO ORSH SURYHQLHQ DWWUDYHUVR HVWUDSROD]LRQL DOOD VWD]LRQH DQHPRPHWULFD JUD]LH DOOD SUHVHQ]D VXOOH VWHVVH YHUWLFDOL GL DQHPRPH

, ULVXOWDWL GHOOH YHULILFKH GL PLQLPR H PDVVLPR FRPPHVVL GLPLQXLVFRQR VHQVLELOPHQWH FRQ GLVWDQ]H WUD OH VWD]LRQL H GL FRPSUHQVLRQH GHOOD FRPSOHVVLWj FRQIHUPDUH OH YDOXWD]LRQL LQWHUSUHWDWLYH

9D FRPXQTXH VRWWROLQHDWR FKH OD GLIIHUHQ]D GL GLYHUVL SXQWL GHO WHUULWRULR WHQHQGR FRQWR GL DL SDUDPHWUL GL YHQWRVLWj FKH DVVRFLDWR DL PRGHOOL SURGX]LRQH SHUz WHQGRQR DG HVVHUH DWWR D YDOXWDUH OD UDJLRQHYROH VWLPD GHO SURJHWWR

6HGH /HJDOH
9LD 0DWWHRWWL 1 ± 9DO 7URPSLD %6
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,VFUL]LRQH QHO 5HJLVWUR ,PSUHVH %UHVFLD
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/D SURGXFLELOLWj ORUGD GHOO¶LPSLDQWR PRGHOODWR YLD DXWRUH LQGLFDWR GDO &RPPLWWHQWH H UDIILJXUDWR DO &DSLWROR

, ULVXOWDWL RWWHQXWL FRQ LO PRGHOOR GL FDOFROR VRQR

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LQIR#WHFQRJDLD LW
(PDLO SHF #SHF WHFQRJDLD FRP

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/D WDEHOOD VRWWRVWDQWH ULSRUWD LQ VLQWHVL OD SURGXFL

6LHPHQV *DPHVD 6*						

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$ WDOH SURGXFLELOLWj ORUGD GHYRQR HVVHUH VRWWUDWWH OH VRQR ULSRUWDWL LVLYUDDOFRRUPDQGDL OSHUUH GLVWRQHDGHSJOLL VRWWRVFULWWL WXWWL L FRQWUDWWL0GLRROFXLWXD YROWDLFWDH GLXVWULEX SURJHWWR HOHWWULFR HVHFXWLYR GHOO¶LPSLDQWR

'HQVLWj DULD DOOD GHQVLWj GL	.J P
'LVSRQLELOLWj DHURJHQHUDWRUL	
'LVSRQLELOLWj DHURJHQHUDWRUL ± QRQ FRQWUDWWXDOH	
'LVSRQLELOLWj % 2 3	
'LVSRQLELOLWj UHWH	
3HUGLWH HOHWWULFKH G¶LPSLDQWR	
3HUGLWH DPELHQWDOL	
3HUIRUPDQFH DHURJHQHUDWRUL	

HVD

'LVSRQLELOLWj &RQWUDWWXDOH GHVWD SHUVJHQWHUR DOO RUDOORUH VWDQ
'LVSRQLELOLWj % 2 3 SHUGLWD FRQVLGHUD LQ IXRUYLH UHO LQYLDO RSHU
GLVSRQLELOLWj JDUDQWLWD GDO SURYLQGHUDOO SH 'HVDXQ]LR GR SRWHU HVW
FKLXVXUD GHOOH QHJR]LD]LRQL GHO FRQWUDWWR 2 0 SHU LO % 2 3

6HGH /HJDOH
9LD 0DWWHRWWL ±DUGRQH 9DO 7URPSLD %6
&RG)LVF 3 ,9$
&DS 6RF ¼ LQWHUDPHQWH YH
,VFUL]LRQH QHO 5HJLVWUR ,PSUHVH %UHVFL
LQIR#WHFQRJDLD LW
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'LVSRQLELOLWj D5HWH SHUGLWD UDSSUHVHQWD JOLHWHY(HQHWXDOLFDX1RQ]L FXL VL FROOHJKHUj O¶LPSLDQWR HGRWLFR W,Q XQDYDHOR QHOLWD Q GDUWD Q HYHQWL DOO¶DQQR GHOOD GXUDWD PHGLD GL RUH

3HUGLWH (OHWWULFKH HOHWWULFKH VRQR VWD]LR QDLV VXQWHSLQ HOHWWULFR ,O YDORUH GRYUj HYHQWXDOPHQWH HVVHUH SUHYLVWR 3URJHWWR

$OWUH SHUGLWH WLHQH FRQWR GHL SDUDPHWUL PHWHRUORJLFL 1RQ WLHQH LQYHFH FRQWR GL DOFXQ ZLVQHG FXUHDWR DOO¶LPSDWWR DFXVWLFR H R OLPLWD]LRQL LQ RUGL VUHQRWH LQIRUPD]LRQL D ULJXDUGR

3UHVWD]LRQH DHURWHUPLFD WLHQH FRQWR GHOOD VFLD GHJOL DHURJHQHUDWRUL QRQ RWWLPDOH GHOOH WXUELQH

1H ULVXOWD SHUWDQWR OD VHJXHQWH SURGXFLELOLWj QHWWD

6LHPHQV *DPHVD 6*						

6HGH /HJDOH
9LD 0DWWHRWWL FDUGRQH 9DO 7URPSLD %6
&RG)LVF 3 ,9$
&DS 6RF ¼ LQWHUDPHQWH Y
,VFUL]LRQH QHO 5HJLVWUR ,PSUHVH %UHVFL
LQIR#WHFQRJDLD LW
(PDLO SHF LQIR#SHF WHFQRJDLD FRP

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1HOOD WDEHOOD GL FXL QHO VHJXLWR VL ULSRUWDQR L FULWHUL PLQLPL ULFKLHVWL GDOOD 5HJLRQH SHU OD ORFDOL]]D]LRQH GHJOL LPSLDQWL HROLFL

‰ 3HU OD GHWHUPLQD]LRQH GHOOD YHORFLWj PHGLD DQQXD GHO YHQWR VL q IDWWR ULIHULPHQWR DO &DSLWROR ³$QDOLVL GHL GDWL´

‰ 3HU OH RUH HTXLYDOHQWL GL IXQ]LRQDPHQWR VL q IDWWR ULIHULPHQWR DOOD VWLPD GHOOD SURGX]LRQH

‰ 3HU OD GHQVLWj YROXPHWULFD q VWDWR FRQVLGHUDWR LO VHJXHQWH DHURJHQHUDWRUH

ƒ (QHUJLD SURGRWWD DQQXDOPHQWH GDOOD WXUELQD FRPH VRSUD

ƒ 'LDPHWUR GL P

ƒ $OWH]]D WRWDOH GHOO¶DHURJHQHUDWRUH WHQHQGR FRQWR GHO PR]]R GL P HG LO UDJJLR GHO URWRUH SDUL D P

D	9HORFLWj PHGLD DQQXD D P GDO VXROR			3RVLWLYR
E	2UH HTXLYDOHQWL GL IXQ]LRQDPHQWR 0:K 0: FRQVLGHUDQGR 3RWHQ]D LPSLDQWR 0: (QHUJLD SURGRWWD DQQR		K DQQR	3RVLWLYR
F	'HQVLWj YROXPHWULFD GL HQHUJLD DQQXD XQLWDULD N:K FRQVLGHUDQGR (QHUJLD SURGRWWD DQQR + PR]]R P ' URWRUH P		SHU RJQL DHURJHQHUDWRUH	3RVLWLYR
G	1XPHUR GL DHURJHQHUDWRUL			3RVLWLYR

3HU L SXQWL E H F LO VXSHUDPHQWR GHL FULWHUL q VWDWR FRQVLGHUDWR LQ &DSLWROR

6HGH /HJDOH
9LD 0DWWHRWWL 7RUWRQD 9DO 7URPSLD %6
&RG)LVF 3 ,9$
&DS 6RF ¼ LQWHUDPHQWH YHUVDWR
,VFUL]LRQH QHO 5HJLVWUR ,PSUHVH %UHVFLD
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(PDLO 3(& WHFQRJDLD#SHF WHFQRJDLD FRP

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,O SUHVHQWH UDSSRUWR FRQWLHQ[illegible]
ULFDGHQWH LQ /RFDOLWj ³/H 6HUUH[illegible]

/D YDOXWD]LRQH GHOOD SURGXFLELOLW[illegible]
IOXLGRGLQDPLFR GHO YHQWR [illegible]
VWD]LRQH GL ULOHYDPHQWR OH FXL [illegible]

/D VHULH GL GDWL GL 5LIHULPHQW[illegible]
QRUPDWLYD UHJLRQDOH q VWDW[illegible]
YDOLGLWj q VWDWD FRQIHUPDWD JUD[illegible]
DUHD FRQVLGHUDWD H D FRQIHUPH JU[illegible]DQDOLVL GL PLFUR

,Q JHQHUDOH OD PHVVD D SXQWR [illegible]
XQD VHULH GL YHULILFKH H GL FRQ[illegible]
SDUWLFRODUH JOL HIIHWWL GHOO[illegible]
GHO YHQWR DO PR]]R GHOOH PDFFKLQ[illegible]
VROX]LRQL SHU GLPLQXLUH LO JUDG[illegible]

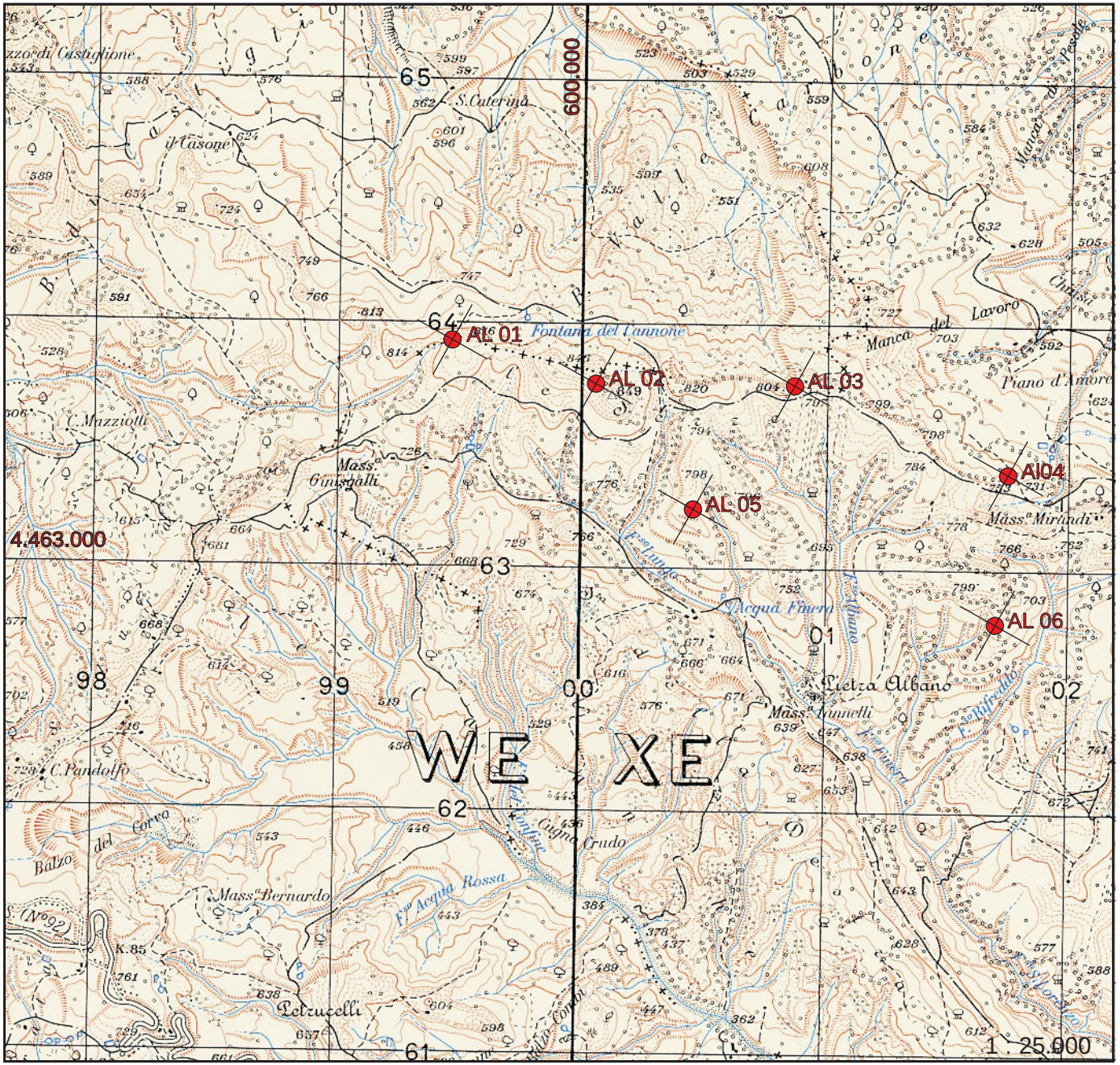
&RPH HYLGHQ]LDWR QHO SUHFHGHQWL [illegible]
DELOLWDWLYR VDUHEEH DXVSLFDELOH [illegible]
SURFHVVL H GHOOH PHWRGRORJLH DSSOLFDWL

, VLWL SL• LQWHUHVVDQWL GDO [illegible]
GD OLYHOOL GL YHQWRVLWj WDOL[illegible]
DQQXH GL IXQ]LRQDPHQWR WDOH GD [illegible]
YDULDUH D VHFRQGD GHOOD WDJOLD[illegible]
H SL• LQ JHQHUDOH GHL FRVWL GL [illegible]PHQWR H GL JHVWLRQH G

,Q SDUWLFRODUH QHOO¶DPELWR [illegible]
YDORUH q VWDWR ILVVDWR LQ [illegible]
XWLOL]]DQGR LO PRGHOOR GL DHURJHQHUDWRUH LSRWL]]DWR

/D PHGHVLPD QRUPDWLYD ILVVD DOW[illegible]
YHULILFDUH FRQ HVLWR SRVLWLYR

Impianto eolico in località Le Serre nel Comune di Aliano (MT)



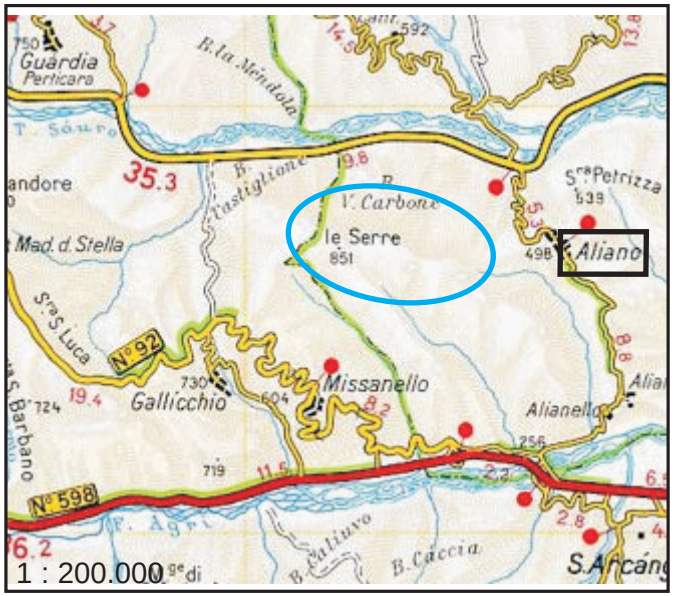
LEGENDA

Aerogeneratore

Area di interesse

N

TecnoGaia S.r.l.



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Siemens Gamesa 5.X
Reaching new heights

SIEMENS Gamesa
RENEWABLE ENERGY

Siemens Gamesa technology with benchmark performance and proven reliability

SG 6.6-155 and SG 6.6-170: Siemens Gamesa next-generation solutions conceived to deliver an outstanding value proposition for our customers

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Imagine how the future becomes present to take wind energy to the next level

At Siemens Gamesa, we strive to anticipate opportunities in an increasingly discerning market. Our wind technology expertise, backed by more than 40 years of experience and over 114 GW installed throughout the world, equips us with the right tools for imagining the future, making it present and taking wind energy to the next level.

We know what this means: technological leadership, solid track record, commitment to excellence, passion for what we do. And we deliver it now to our customers. This is how the new Siemens Gamesa 5.X onshore platform is born.

Siemens Gamesa 5.X is a new generation of turbines that takes Siemens Gamesa to new heights:

- In performance, cost-ef ciency and reliability.
- In power output and rotor size to offer the most competitive LCoE.
- In technology, built upon Siemens Gamesa know-how and expertise.
- In versatility, with a modular, exible design that facilitates logistics, construction and service.
- In site adaptability, to con gure the optimal solution for each project.
- In value for our customers.

Proven technology

The new Siemens Gamesa 5.X onshore platform has its roots in Siemens Gamesa technology, synonymous with innovation, know-how and reliability accredited through experience. Siemens Gamesa 5.X incorporates proven technologies, minimizing risk and guaranteeing reliability for its two new product models: SG 6.6-155 and SG 6.6-170 wind turbines. These include a doubly-fed generator and partial converter combination, a compact drive train design with a three-stage gearbox, and the use of components widely validated on the other Siemens Gamesa platforms. The result is a wind turbine design that gives optimum performance and LCoE.

Benchmark in power output and rotor size

Siemens Gamesa 5.X goes one step further to become the new generation platform that combines a exible power rating from 5.6 MW to 6.6 MW with two of the largest rotor diameters in the market, 155 and 170 meters, resulting in maximum performance in high-, medium- and low-wind conditions.

SG 6.6-155 and SG 6.6-170 turbines mean greater AEP per wind turbine and optimized CAPEX for the project. This is also due to their versatility, with a modular, exible design for maximum ease of logistics, construction and O&M, as well as reducing the OPEX, which results in a lower Cost of Energy for projects.

Unique, tailored solutions

Siemens Gamesa 5.X considers pro tability to be a key factor in generating value for our customers. Contributing factors to pro tability include:

- Con guring exible, personalized power modes fully tailored to the needs of each site.
- An extensive catalog of towers with multiple available technologies and the additional capability to create speci c project designs.
- The use of advanced control strategies that enable intelligent load reduction and a greater applicability for the Siemens Gamesa 5.X platform in different wind conditions.
- A modular, optimized structure for local transport and construction conditions.
- A maintainability-oriented design with advanced diagnostics and remote operation solutions, as well as the possibility of replacing large turbine components without requiring a main crane.
- Optional product solutions to cover all types of market requirements.

Technical speci cations

	SG 6.6-155	SG 6.6-170
General details		
Rated power	6.6 MW	
Wind class	Medium and high	Low and medium
Flexible power rating	From 5.6 MW to 6.6 MW	
Control	Pitch and variable speed	
Rotor		
Diameter	155 m	170 m
Swept area	18,869 m²	22,697 m²
Tower		
Height	90, 102.5, 122.5, 165 m and site-speci c	100, 115, 135, 165 m and site-speci c
Technology		
Type	Geared	
First prototype		
Date	2021	

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07/2021

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9LD 0DWWHRWWL ± 6&$/$ *UDGR±9DO ± 7URPSLD %6
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7HO ±)D[
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(PDLO 3(& WHFQRJDLD#SHF WHFQRJDLD FRP
6HGH /HJDOH
9LD 0DWWHRWWL ± 9DO 7URPSLD %6
&RG)LVF 3 ,9$
&DS 6RF ¼ LQWHUDPHQWH YHUVDWR
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&XUYD GL GXUDWD GHOOD YHORFLWj GHO YHQWR

7XUEROHQ]D SHUFHQWXDOH GHOOD YHORFLWj GHO YHQWR

5DSSRUWR GL UDIILFD GHOOD YHORFLWj GHO YHQWR

*UDGLHQWH DO VXROR GHOOD YHORFLWj GHO YHQWR

&RQWHQXWR HQHUJHWLFR GHO YHQWR

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- $ 5DFFROWD GHOOD GRFXPHQWD]LRQH WHFQLFD GHOOD VWD]LRQH

- $ 7DEHOOH GHOOH GLVSRQLELOLWj GDWL DQHPRPHWULFL

- $ 5LVXOWDWL GHOOH HODERUD]LRQL VWDWLVWLFKH GHL GDWL

PREMESSA

Per la qualificazione del poten[illegible] velocità e della direzione del [illegible]

A questo scopo [illegible] una stazione anemo[illegible] patrimonio [illegible]

La stazione opera senza [illegible] realizzazione dell'impianto in [illegible] Basilicata

Il presente documento [illegible] riporta i risultati delle [illegible] Riferimento Codice RIF [illegible] di installazione quello di man[illegible] velocità nonché il certificato [illegible] transcodifica e di validazione dei dati

Al fine di stimare la ventosità [illegible] storicizzazione del periodo pre[illegible] oltre anni

LA STAZIONE ANEMOMETRICA

La stazione in oggetto è stata in[illegible] d'acciaio strallato di alte[illegible] inizialmente sul[illegible]

Tipo di apparecchio	Altezza dal suolo	Marca	Modello	Matricola
Sensore di velocità		NRG		C TG
Sensore di direzione		NRG		P TG
Acquisitore		NRG	PLUS	

Come da successivo report di [illegible] sono stati acq[illegible]

Tipo di apparecchio	Altezza dal suolo	Marca	Modello	Matricola
Sensore di velocità		NRG		C
Sensore di direzione		NRG		P TG
Acquisitore		SECONDWIND	NOMAD	

/D VWD]LRQH DQHPRPHWULFD QHO VXR [illegible]
GHOOD QRUPDWLYD YLJHQWH ,(& VLWLYD [illegible]

x LO GLPHQVLRQDPHQWR [illegible]

x OH SURYH GL FHUWLILFD]LRQH GHOO [illegible]
SURYH HIIHWWXDWH [illegible]

x OH FDUDWWHULVWLFKH SURSULH [illegible] VHQVRUL XWLOL]]DWL

1HO SURVHJXR YHUUDQQR GHVFULWWD [illegible]

, VHQVRUL DQHPRPHWULFL

,O VHQVRUH SHU OD PLVXUD GHOOD [illegible]
& 0D[LPXP $QHPRPHWHU &DOLEUDWH [illegible]
P V H IRQGR VFDOD GL P V HVVR [illegible]
DOOD YHORFLWj GHO YHQWR &RSLD [illegible]
GLVSRQLELOH [illegible] DOLPHQWD]LRQH

/D PLVXUD GHOOD GLUH]LRQH GHO [illegible]
3 :LQG 9DQH FRQ OD EDQGHUXROD [illegible]
YDORUH GL UHVLV [illegible] EDQGHUXROD QHOO
ULVSHWWR DG XQR]HUR FRQYHQ]LRQDOH 1RUG

/¶DFTXLVLWRUH GDWL

2ULJLQDULDPHQWH OD FHQWUDOLQD [illegible]
PLVXUD HUD FRVWLWXLWD GD XQ [illegible]
JUDGR GL UHJLVWUDUH SUHHODERUD [illegible]
GLUH]LRQH GHO YHQWR 6XFFHVVLYDPHQWH [illegible]
VRVWLWXLUH O¶DFTXLVLWRUH GDW [illegible]
VLVWHPD FDPSLRQD OH JUDQGH]]H RJQL [illegible]
JUDQGH]]H

¾ 9HORFLWj PHGLD GHO YHQWR

¾ 9HORFLWj PDVVLPD GHO YHQWR

¾ 9HORFLWj PLQLPD GHO YHQWR

¾ 6FDUWR TXDGUDWLFR PHGLR GHOOD YHORFLWj YHQWR

¾ 6HWWRUH GL GLUH]LRQH SUHYDOHQWH [illegible]
ƒ FRQ OR]HUR D 1RUG HG LO VHQ [illegible] RUDULR

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,PSLDQWR HROLFR LQ ORFDOLWj 7RUUH 6DQ 0DUWLQR 5HWUH QHO &RPXQH GL

6WXGLR DQHPRORJLFR H FDUWD 9DOXWD]LRQH GHOOD SURGXFLELOLWj GHO SDUFR HROLFR (

/D VWD]LRQH GL 5LIHULPHQWR QHO SHULRGR FRPSUHVR WUD LO GHOO¶DFTXLVLWRUH 6(&21': ,1'8670 6'D WL GHO FDPSR DQHPRPHWULFR FDPSLRQH KDQQR LO VHJXHQWH DVSHWWR

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ƒ FROR	6FDUWR TXDGUDWLFR PHGLR	P V	2JQL PLQXWL
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ƒ FROR	9DORUH PLQLPR ƒ EDW	9ROW	2JQL PLQXWL
ƒ FROR	9DORUH PLQLPR ƒ EDW	9ROW	2JQL PLQXWL
ƒ FROR	9DORUH PLQLPR EDWW	9ROW	2JQL PLQXWL

8QD VXFFHVVLYD WUDVFRGLILFD PHGLDQWH DSSRVLWR SURJUDPPD SHUPHWWH GL LQ XQ IRUPDWR VWDQGDUG LQWHUQR GL DUFKLYLD]LRQH FKH VL EDVD VX SDUDPHWUL SRL YL

8Q RSHUDWRUH TXDOLILFDWR SURFHGH DOOD YDOLGD]LRQH GHL GDWL DWWUDYHUVR XQ FRQWUROOR RSSRUWXQDPHQWH SUHGLVSRVWR GDO WDOH RSHUDWRUH HVHJXH JUDQGH]]H QHO WHPSR FRQIURQWDQGR L GDWL GHOOD VWHVVD VWD]LRQH SUHVHQWL FRQ GDWL FRQWHPSRUDQHL GL DOWUH VWD]LRQL &RQ LQFURFLDWR q SRVVLELOH LQGLYLGXDUH DQRPDOLH QHO IXQ]LRQDPHQWR GHOOD

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6XOOD EDVH GHOOH LQGLFD]LRQL [illegible]

q SRVVLELOH DQFKH LGHQWLILFDUH [illegible]

VWHVVL SHU IRUPD]LRQH GL JKLDFFLR [illegible]

DYHQGR FXUD GL DQQRWDUQH VX DSSRVLWR [illegible]

GHOO¶HOLPLQD]LRQH , GDWL JUH]]L [illegible]

/D GLVSRQLELOLWj JLRUQR SHU JLRUQR [illegible]

H SHU O¶LQWHUR SHULRGR XWLOL]]DWR [illegible]

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3HU OD VWD]LRQH LQ RJJHWWR VL [illegible]

GLVSRQLELOLWj GHO GDWR YDOLGR SHU L q [illegible]

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&RGLFH	'HQRPLQD]LRQH	'XUDWD PLVXUH	3HULRGR GL PLVXUD		'LVSRQLELOLWj
		PHVL	,QL]LR	)LQH	
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&RQ L GDWL HOHPHQWDUL GHOOD YHORFLWj [illegible]

PLQXWL YHQJRQR [illegible]

DQHPRORJLFR

, ULVXOWDWL GL WDOH DQDOLVL [illegible]

QH [illegible] JXLGD DOO¶LQWHUQR [illegible]

VRSUD FLWDWR PHQWUH [illegible]

'L VHJXLWR VL ULSRUWDQR LQ VLQWHVL [illegible]

&RGLFH	'HQRPLQD]LRQH	&RRUGLQDWH 87)XVR		4XRWD V O P	$OWH]]D VRVWHJQR P	3HULRGR VWD]LRQH	
		/RQJLWX	/DWLWX			,QL]LR	)LQH
5,)	5LIHULPHQWR ƒ ¶ (ƒ ¶ 1						$WWLYD

6HGL RSHUDWLYH
9LD 0DWWHRWWL ± 6&$)$7 [illegible] ± 7URPSLD %6
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6HGH /HJDOH
9LD 0DWWHRWWL [illegible] ± 9DO 7URPSLD %6
&RG)LVF 3 ,9$
&DS 6RF ¼ LQWHUDPHQWH YH
,VFUL]LRQH QHO 5HJLVWUR ,PSUHVH %UHVFLD

(PDLO LQIR#WHFQRJLDLD LW
(PDLO [illegible]#SHF WHFQRJLDLD FRP

, ULVXOWDWL VLQWHWLFL GHOO¶DQDOLVL DQHPRORJLFD GL FXL VRSUD VRQR ULDVVXQWL QHOOD WDEHOOD VHJXHQWH
HODERUDWR VRQR L VHJXHQWL

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&XUYD GL GXUDWD GHOOD YHORFLWj GHO YHQWR

9LHQH LQQDQ]LWXWWR FRVWUXLWD OD FXUYD GL GXUDWD GHOOD YHORFLWj GHO YHQWR FKH HVSULPH OD SHUFHQWXDOH GL WHPSR LQ FXL XQ GHWHUPLQDWR YDORUH GHOOD YHORFLWj GHO YHQWR YLHQH VXSHUDWR

7DOH FXUYD q LQ JHQHUH UDSSUHVHQWDWD EHQH GDOOD GLVWULEX]LRQH GL SUREDELOLWj OD FXL FXPXODWD q GDWD GDOOD IRUPXOD

$$F(V) = 100 \cdot \exp\left[-\left(\frac{V}{Vc} \right)^{k} \right]$$

GRYH 9PHG q LO YDORUH GHOOD YHORFLWj PHGLD GHO YHQWR LQ SHUFHQWXDOH ... FRPSOHVVLYR LQ FXL WDOH YHORFLWj YLHQH VXSHUDWD

'L WDOH GLVWULEX]LRQH L SDUDPHWUL LQWULQVHFL FLRq OD YHORFLWj FDUDWWHULVWLFD H LO IDWWRUH GL IRUPD VRQR GHWHUPLQDWL D SDUWLUH GDL GDWL VSHULPHQWDOL

7XUEROHQ]D SHUFHQWXDOH GHOOD YHORFLWj GHO YHQWR

8Q DOWUR SDUDPHWUR VLJQLILFDWLYR q OD WXUEROHQ]D GHILQLWD SHU RJQL LQWHUYDOOR GL PLQXWL FRPH

$$T = 100 \cdot sigV(10') / Vmed(10')$$

GRYH VLJ9 q OR VFDUWR TXDGUDWLFR PHGLR GHOOD YHORFLWj UHODWLYD GHOOD YHORFLWj HQWUR O LQWHUYDOOR

5DSSRUWR GL UDIILFD GHOOD YHORFLWj GHO YHQWR

8Q XOWHULRUH SDUDPHWUR VLJQLILFDWLYR q LO UDSSRUWR GL UDIILFD SHU RJQL LQWHUYDOOR GL PLQXWL FRPH

$$R = maxV(10')/Vmed(10')$$

GRYH PD[9 q LO YDORUH PDVVLPR LVWDQWDQHR ... O LQIRUPD]LRQH VXOOD LQWHQVLWj GHOOH UDIILFKH ...

*UDGLHQWH DO VXROR GHOOD YHORFLWj GHO YHQWR

4XDORUD VLDQR GLVSRQLELOL [illegible] GD GXH GLIIHUHQWL DOWH]]H GDO VXROR q SRVVLELOH VWLPDUH [illegible] DOID 7DOH LQGLFH SHUPHWWH GL [illegible] VXSHULRUH DOO¶DOWH]]D [illegible] GLYHUVH

/D UHOD]LRQH FKH SHUPHWWH GL VWLPDUH [illegible] VHJXHQWH IRUPXOD

$$V \quad V \quad h \quad h^{alfa}$$

GRYH [illegible] JUDGLHQWH GHOOD YHORFLWj [illegible] FRUULVSRQGHQWL [illegible] GDO VXROR

$YHQGR TXLQGL D GLVSRVL]LRQH [illegible] SRVVLELOH VWLPDUH [illegible] YDORUH VL RWWLHQH GDOO¶DSSOLFD]LRQH GHOOD VHJXHQWH IRUPX[illegible]

$$alfa \quad \log V \quad \log h$$

&RQWHQXWR HQHUJHWLFR GHO YHQWR

3HU TXDQWR ULJXDUGD [illegible] SRWHQ]D [illegible] FRPH SRWHQ]D FKH IOXLVFH [illegible] SHUSHQGLFRODUPHQWH [illegible] YHORFLWj

$$P_V \quad \frac{1}{2} \rho V$$

GRYH q OD GHQVLWj GHOO DULD FKH [illegible] FRQGL]LRQL VWDQGDUG GL [illegible] 1.225 kg/m H WHPSHUDWXUD

,QWHJUDQGR QHO WHPSR [illegible] VXSHULILFLH SHUSHQ[illegible] HQHUJLD VSHFLILFD GHO VLWR 7DOH [illegible] q HVSULPLELOH FRQ [illegible]

$$E_V \quad \rho \overline{V} \quad T$$

GRYH $\overline{V}$ q OD YHORFLWj PHGLD [illegible] DQQR RUH

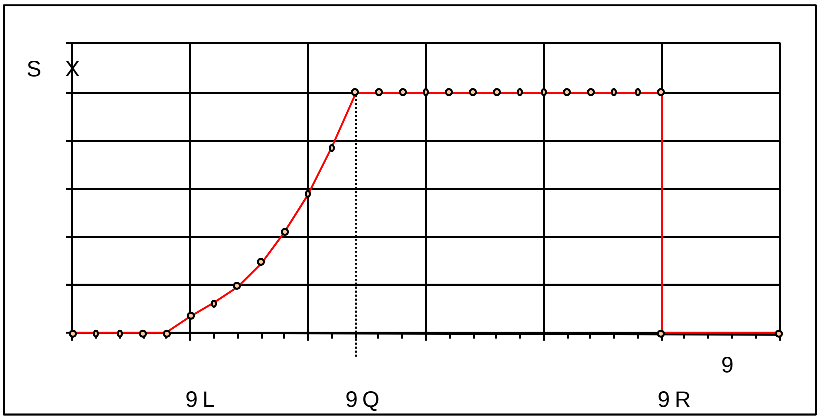
0ROWLSOLFDQGR [illegible] SHU [illegible] GL XQD PDFFKLQD HROLFD [illegible] FKH WUDQVLWD DQQXDOPHQWH DWWUDYHUVR LO GLVFR URWRULFR

(QHUJLD SURGRWWD GD XQ DHURJHQHUDWRUH

/ HQHUJLD HIIHWWLYDPHQWH SURGXFLELOH GD XQ DHURJHQHUDWRUH FRQ XQD YHORFLWj GHO YHQWR GHOO HQHUJLD VRSUD LQGLFDWD ,Q 3J LQ SURWRWLSR H VL SXz SRUUH LVWDQWDQHD 9 XQ YROXPH GL DULD FXELFD SRUWDWD SHU XQLWj GL WHPSR GL SRWHQ]D GLSHQGHQWH GDOOD YHORFLWj H DULD VXSHULRUH DO

$$P_V = \frac{1}{2} \cdot C_p \cdot \rho S \cdot V$$

,O SURILOR FKH QH ULVXOWD FXUYD GL SRWHQ]D FKH LQGLFD OD SRWHQ]D HIIHWWLYD ULVFRQWUDQR VWUHWWH DQDORJLH FRQ TXHOOR GHOO HQHUJLD LQ XQ SURILOR WLSLFR 9Q DOOD YHORFLWj GL FXW LQ 3J QRQ OD VL KD SRWHQ]D JHQHUDWD SRL FUHVFH FRQ OD YHORFLWj 3Q QRPLQDOH FRUULVSRQGHQ]D GHOOD TXDOH VL UDJJLXQJH OD SRWHQ]D QHOOD PDJJLRUDQ]D GHL FDVL DO YDORUH GL FXW RXW 9R RWWHQHQGR D TXDO JHQHUD]LRQH



'DWR FRPXQTXH LO SURILOR GL HURJD]LRQH GHOOD PDFFKLQD SUH YHORFLWj GHO YHQWR LO FDOFROR GHOOD FXUYD GL SRWHQ]D VL HVHJXH LQWHJUDQGR ULVSHWWR DOOD YHORFLWj OD SUREDELOLWj GHOOD YHORFLWj GHO YHQWR FRQVLGHUDWR

/D YDOXWD]LRQH GHOOD SURGXFLELOLWj GL HYHQWXDOH FHQWUDOH GHO PR]]R GHOOD PDFFKLQD XWLOL]]DQGR OD YHORFLWj PHGLD XOWHULRUH DIILQDPHQWR GHO FDOFROR VL SURSRU]LRQDOL DOOD YDULD]LRQH GHOOD GHQVLWj GHOO DULD

/D SURGXFLELOLWj QHOO DUFR GHOO DQQR GHO QXPHUR GL RUH HTXLY JHQHUD]LRQH D SLHQD SRWHQ]D GDWR GDO UDSSRUWR (S 3Q RPLQDOH

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Scheda della stazione anemometrica

TecnoGaia s.r.l.

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'DWD	&RGLILFD GRFXPHQWR	$UFKLYLR	&RPSLODWR GD

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6H]LRQH % ± 'DWL LGHQWLILFDWLYL GHOOH DSSDUHFFKLDWXUH

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6267(*12 7LSR 7UDOLFFLR)UDFD P 1ƒ 0$75

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&RPXQH GL &$/9(//2 3URYLQFLD 3= 5HJLRQH %$6,/,&$7$

7DYROHWWD ,*0, &$/9(//2)RJOLR Qƒ 1(

&RRUGLQDWH GHO 5HWLFROR 870 Qƒ LQ PHWUL

$OWLWXGLQH P

8WLOL]]R GHO 3RVVHVVRUH $FFHVVLELOLWj 6&$56$

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6DUj HIIHWWXDWD GD 7(&12*$,$

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TecnoGaia S.r.l.

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SOH Wind Engineering LLC
141 Leroy Road Â Williston, VT 05495 Â USA
Tel 802.316.4368 Â Fax 802.735.9106 Â Z Z Z V R K Z L Q G F F

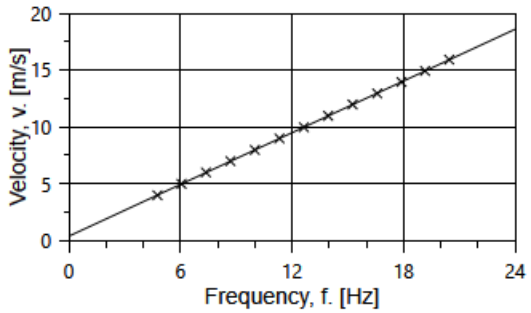
CERTIFICATE FOR CALIBRATION OF CUP ANEMOMETER

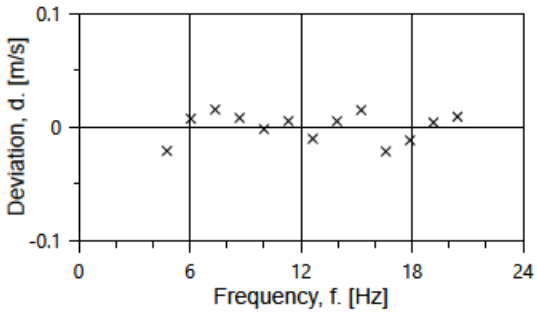
Certificate number: 19.US1.02175 Date of issue: November 20, 2019
Type: NRG 40C Anemometer Serial number: 179500328134
Manufacturer: NRG Systems Inc, 110 Riggs Road, Hinesburg, VT 05461, USA
Client: NRG Systems Inc, 110 Riggs Road, Hinesburg, VT 05461, USA
Anemometer received: November 13, 2019 Anemometer calibrated: November 18, 2019
Calibrated by: RDS Procedure: MEASNET, IEC 61400-12-1:2017 Annex F
Certificate prepared by: EJF Approved by: Calibration engineer, EJF

Calibration equation obtained: $v\ [m/s] = 0.75949 \cdot f\ [Hz] + 0.36403$

Standard uncertainty, slope: 0.00097 Standard uncertainty, offset: 0.02753
Covariance: -0.0000069 $(m/s)^2/Hz$ Coefficient of correlation: U 0.999995
Absolute maximum deviation: -0.022 m/s at 12.941 m/s
Barometric pressure: 999.1 hPa Relative humidity: 19.7 %

Succession	Velocity pressure, q. [Pa]	Temperature in wind tunnel [°C]	d.p. box [°C]	Wind velocity, v. [m/s]	Frequency, f. [Hz]	Deviation, d. [m/s]	Uncertainty u_c (k=2) [m/s]
2	9.24	22.3	28.0	3.963	4.7671	-0.021	0.023
4	14.54	22.4	28.0	4.972	6.0585	0.007	0.026
6	21.02	22.4	28.0	5.979	7.3736	0.015	0.030
8	28.58	22.4	28.0	6.973	8.6909	0.008	0.034
10	37.26	22.4	28.0	7.961	10.0058	-0.002	0.038
12	47.33	22.4	28.0	8.974	11.3294	0.005	0.042
13-last	58.25	22.4	28.0	9.955	12.6425	-0.011	0.047
11	70.65	22.4	28.0	10.964	13.9502	0.005	0.051
9	84.16	22.4	28.0	11.966	15.2572	0.015	0.055
7	98.43	22.4	28.0	12.941	16.5889	-0.022	0.059
5	114.24	22.4	28.0	13.942	17.8933	-0.012	0.064
3	130.82	22.3	28.0	14.919	19.1594	0.004	0.068
1-first	148.83	22.3	28.0	15.911	20.4591	0.009	0.072





AC-1746

EQUIPMENT USED

Serial Number	Description
Njord1	Wind tunnel, blockage factor 1.0017
2254	Control cup anemometer
-	Mounting tube, D = 12.7 mm
TT004	Summit Electronics, 1XPT100, 0-10V Output, wind tunnel temp.
TP001	PR Electronics 5102, 0-10V Output, differential pressure box temp.
DP004	Setra Model 239, 0-1 inWC, differential pressure transducer
HY004	Dwyer RHP-2D20, 0-10V Output, humidity transmitter
BP002	Setra M278, 0-5VDC Output, barometer
PL8	Pitot tube
XB002	Computer Board. 16 bit A/D data acquisition board
Njord1-PC	PC dedicated to data acquisition

7KH DFFXUDFLHV RI DOO PHDVXUHPHQWV ZHUH WUDFHDEOH WR QDWLRQDO VWDQGDUGV WKURXJK 1, the data acquisition software detects pulse frequency.

Photo of the wind tunnel setup. The cross-sectional area is 2.5m x 2.5m.

UNCERTAINTIES

The documented uncertainty is the total combined uncertainty at 95% confidence level (k=2) in accordance with EA 4/02. The uncertainty at 10 m/s comply with the requirements in IEC 61400-12-1:2005 procedure. See Document US.12.01.004 for further details.

COMMENTS

(none)

Certificate number: 19.US1.02175

The results on this certificate relate only to the serial number listed.
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SPECIFICATIONS
NRG #40C Anemometer

FEATURES

- The standard anemometer used in the wind energy industry
- Short distance constant
- Simple, durable design

The NRG #40C anemometer is the industry standard anemometer used worldwide. NRG #40 anemometers have recorded wind speeds of 96 m/s (214 mph). Their low moment of inertia and unique bearings permit very rapid response to gusts and lulls. Because of their output linearity, these sensors are ideal for use with various data retrieval systems. A four pole magnet induces a sine wave voltage into a coil producing an output signal with a frequency proportional to wind speed. The #40C is constructed of rugged Lexan cups molded in one piece for repeatable performance. A protective rubber terminal boot is included.

SPECIFICATIONS

Description	Sensor type	3-cup anemometer
	Applications	x wind resource assessment x meteorological studies x environmental monitoring
	Sensor range	1 m/s to 96 m/s (2.2 mph to 214 mph) (highest recorded)
	Instrument compatibility	all NRG loggers
Output signal	Signal type	low level AC sine wave, frequency linearly proportional to windspeed
	Transfer function	m/s = (Hz x 0.765) + 0.35 [miles per hour = (Hz x 1.711) + 0.78]
	Accuracy	within 0.1 m/s (0.2 mph) for the range 5 m/s to 25 m/s (11 mph to 55 mph)
	Calibration	each anemometer individually calibrated, calibration reports provided via electronic download
	Output signal range	0 Hz to 125 Hz (highest recorded)

SPECIFICATIONS

Response characteristics	Threshold	0.78 m/s (1.75 miles per hour)
	Distance constant (63% recovery)	3.0 m (10 feet)
	Moment of inertia	68 x 10^{-6} S-ft^2
	Swept diameter of rotor	190 mm (7.5 inches)
Installation	Mounting	onto a 13 mm (0.5 inch) diameter mast with cotter pin and set screw
	Tools required	0.25 inch nut driver, petroleum jelly, electrical tape
Environmental	Operating temperature range	-55 °C to 60 °C (-67 °F to 140 °F)
	Operating humidity range	0 to 100% RH
Physical	Connections	4-40 brass hex nut/post terminals
	Weight	0.14 kg (0.3 pounds)
	Dimensions	› 3 cups of conical cross-section, 51 mm (2 inches) dia. x 81 mm (3.2 inches) overall assembly height
Materials	Cups	one piece injection-molded black polycarbonate
	Body	housing is black ABS plastic
	Shaft	beryllium copper, fully hardened
	Bearing	modified Teflon, self-lubricating
	Magnet	Indox 1, 25 mm (1 inch) diameter, 13 mm (0.5 inch) long, 4 poles
	Coil	single coil, bobbin wound, 4100 turns of #40 wire, shielded for ESD protection
	Boot	protective PVC sensor terminal boot included
	Terminals	brass

SPECIFICATIONS

NRG #200P Wind Direction Vane

FEATURES

- The standard wind direction vane used in the wind energy industry
- Simple, durable design
- Corrosion-resistant materials

The NRG #200P wind direction vane is the industry standard wind direction vane used worldwide. The thermoplastic and stainless steel components resist corrosion and contribute to a high strength-to-weight ratio. The vane is directly connected to a precision conductive plastic potentiometer located in the main body. An analog voltage output directly proportional to the wind direction is produced when a constant DC excitation voltage is applied to the potentiometer. A rubber terminal boot is included.

SPECIFICATIONS

Description	Sensor type	continuous rotation potentiometric wind direction vane
	Applications	€ wind resource assessment € meteorological studies € environmental monitoring
	Sensor range	360° mechanical, continuous rotation
	Instrument compatibility	all NRG loggers
Output signal	Signal type	Analog DC voltage from conductive plastic potentiometer, 10K ohms
	Transfer function	Output signal is a ratiometric voltage
	Accuracy	potentiometer linearity within 1%
	Dead band	8° Maximum, 4° Typical
	Output signal range	0 V to excitation voltage (excluding deadband)
Power requirements	Supply voltage	Regulated potentiometer excitation of 1 V to 15 V DC
Response characteristics	Threshold	1 m/s (2.2 miles per hour)
Installation	Mounting	onto a 13 mm (0.5 inch) diameter mast with cotter pin and set screw
	Tools required	0.25 inch nut driver, petroleum jelly, electrical tape
Environmental	Operating temperature range	-55 °C to 60 °C (-67 °F to 140 °F)

SPECIFICATIONS

	Operating humidity range	0 to 100% RH
	Lifespan	50 million revolutions (2-6 years normal operation)
Physical	Connections	4-40 brass hex nut/post terminals
	Weight	0.14 kg (0.3 pounds)
	Dimensions	€ 21 cm (8.3 inches) length x 12 cm (4.3 inches) height € 27 cm (10.5 inches) swept diameter
Materials	Body	black UV stabilized static-dissipating plastic
	Shaft	stainless steel
	Bearing	stainless steel
	Wing	black UV stabilized injection molded plastic
	Boot	protective PVC sensor terminal boot included
	Terminals	brass

NOMAD™ 2 WIND DATA LOGGER SPECIFICATIONS

SENSOR INPUTS

12 counter inputs	• Configurable for AC & pulse anemometers, other frequency-output devices, and high/low digital or relay state signaling
	• Frequency range DC to 2 kHz • High display resolution with low frequency anemometers • Input high/low threshold configurable for 0V or 3V • Configurable filtering for low frequency devices • 1-second count integration, ±0.02% accuracy
8 analog inputs	• Configurable range of 0 to 2.5V or 5V • 12-bit analog to digital conversion • 1-second sampling, ±0.02% accuracy • Direct interface to potentiometer wind vanes, 10k thermistors, and analog-output transducers
Fault detection	• Feedback input from 2.5V+ excitation output for wiring and device fault detection
Internal temperature	• 1-second sampling, ±2ªC accuracy
Power supplies	• Measurement of two 9V batteries and 12V power

OUTPUTS

2.5V+ excitation:	• 2.5V+ smart-switched excitation distributed to all input terminal blocks for energy-conserving measurement of potentiometers and thermistors • Calibrated to ±5mV, 25 ppm/°C, 250 mA max
12V transducer power	• 12V+ smart-switched transducer power output distributed to all input terminal blocks for energy-conserving operation of electronic transducers • 1 Amp maximum
12V modem power	• 12V+ configurable switched modem power output for energy-conserving operation of cellular & other modems • 1 Amp maximum
Relay output	• For de-icing or other control applications • SPST dry contact, 1 Amp maximum, AC or DC • Modbus-controlled

POWER SUPPLY

9 Volt batteries:	• 2 parallel standard 9V batteries in sliding receptacles • Up to 6 months operation with alkaline, up to one year with lithium (-40°C) batteries that have no shipping restrictions
12 Volt Power:	• 12V (10-18V DC) input for internal primary or rechargeable batteries, external DC power supply, or regulated solar panel • Two-screw removable internal mounting for lead-acid batteries for higher power transducer, controls, and communication gear, standard sizes up to 20 AH, extreme environment sizes up to 8 AH
Solar:	• Optional on-board solar charging regulator/controller

SERIAL PORTS

	• 3 independent RS232C serial ports, up to 115 kBaud
Local port	• Direct straight-cable connection to laptop or PC • Standard pinout DB9, DCE
Remote port	• Connects to modem, radio, or asynch network adapter • Auto-wakeup Rx input • Internally connected for SWI-supplied modem options • Field-wireable terminals for customer-installed devices
Device Port:	• Connects to and logs from communicating transducers including multifunction Phaser® power transducers & ultrasonic anemometers • Pollable Modbus RTU for SCADA and other general applications

ESD PROTECTION

- All inputs, outputs, and serial port signaling transient and fault protected
- No additional lightning protection needed

USER INTERFACE

Local Display:	• 4 x 20 alphanumeric character display, LCD or VFD • Configurable smart-switched power • Automatic temperature-compensating LCD contrast
Keypad	• 7-key sealed membrane keypad
Remote interface	• Full display, configuration, data transfer, & firmware upgradability by local port or modem connection to any PC via NOMAD Desktop™
Status light:	• Heartbeat LED indicates operational status independent of display

INPUT AND DATA PROCESSING

Wind speed	• Slope & offset scaling, auto-zeroing for counter inputs
Wind direction	• Modulo 360° and true vector processing • Deadband location correction
Temperature	• Thermistor linearization to device accuracy (±0.1°C)
Math functions	• Average, standard deviation, maximum, time of maximum, minimum, time of minimum, total, cycles, sample value
Recording intervals	• 1 minute, 10 minutes, hourly, or daily in any combination for all inputs and math functions

DATA STORAGE

Media	• Industry/consumer standard Compact Flash, up to 256MB • Read/write-able by any notebook or desktop PC via PCMCIA adapter or any USB-type Compact Flash adapter • Full -40° to 85°C operation rated devices available
Formats	• Card directory & file formats are fully Windows™ compatible • Any FAT (PC) formatted Compact Flash card fully usable • Data written to daily files in named monthly subdirectories • Each datum in standard IEEE floating point format, indexed for positive database ID independent of file name/location • Each datum time-stamped in Universal Time (UT/GMT), configurable for time zone & daylight savings offsets
Transfer	• Files transferable by card removal, local serial connection, remote dial-up connection, or as e-mail attachments

PHYSICAL

Operating temp:	• -40° to 85°C all specifications (Vacuum Fluorescent Display)
LCD temperature:	• LCD operates from -20° to 70°C, storage -30° to 80°C
Internal RT clock	• ±1 minute/month accuracy, internet time-server adjustable • Backed up by socketed 2032 Lithium coin cell (10 year life)
Wire & cabling	• 12 six-screw, 0.2" (5mm) cage clamp style terminal blocks • Signal, ground, excitation, switched & unswitched 12V power distributed to each of 8 terminal blocks • Standard SMA-F bulkhead connector for external antennas • Four 3/4" npt/pg21 knockouts for cable & conduit installation
Enclosure	• Integrated waterproof instrument enclosure, wire and cable junction box, and lockable rain shed • Upper section NEMA4/IP66 (watertight), lower section NEMA3R (rain tight) or NEMA4 with cable glands • 16 ga. steel, 14 ga. mounting flanges, TGIC powdercoated • 14 x 12 x 5.5 inches (350 x 300 x 140mm), 20 lbs. (9 kg) • Mini-rack mounting for internal modem options • Swing-out panels for modem and 12V battery access • Surface, truss-tower, or tube-tower mounting • Single no-tools padlockable hasp closure

AVAILABLE OPTIONS

- Vacuum Fluorescent Display
- GSM/GPRS, CDMA, and AMPS cellular modems
- Satellite modem (Iridium)
- Landline telephone (POTS) modem
- Integrated solar charging systems, including charge regulator, panel, mounting brackets, and lead-acid batteries

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6RQR LQROWUH VWLPDWL L SDUDPHWUL ...

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FRORQQD QXPHUR G RUGLQH GHO VHWWRUH ...

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FRQ QRQ PHGLD FXELFD GHOOH YHORFLWj V_{cub}

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7$%/(/$ & 6RQR ULSRUWDWL L SDUDPHWUL FDUDWWHULVWLFL GHOOD GLVWULEX]LRQH PHQVLOH GHOO DQQR FRQ LQGLFD]LRQH GHO PHVH SLR PHQVLOH WULPHVWUL SDUDWL FRPH PHQVLOH TXH SUHFHGHQWH WDEHOOD VRQR ULSRUWDWL SHU RJQL PHVH LQ HQHUJLD H VXSHUDPHQWR GHOOH PHGLH

FRQ QRQ QRPH GHO PHVH

FRQ QRQ QXPHUR GL PHVL HTXLYDOHQWL GL GDWL DFTXLVLWL SHU TXHO PHVH WRWDOH GL GDWL DFTXLVLWL HQWUR TXHO PHVH WRWDOH GL GDWL DWWHVL QHO SHULRGR GL TXHO

FRQ QRQ YHORFLWj PHGLD QHO PHVH LQ P V

FRQ QRQ VFDUWR TXDGUDWLFR PHGLR GHOOH YHORFLWj QHO PHVH

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'DL GDWL PHGL PHQVLOL VRQR SRL FDOFRODWH OH VWHVVH JUDQGH]]H FRORQQD H TXLQGL L YDORUL PHGL DQQXDOL SHU OH YDULDELOL YHORFLWj GHO YHQWR PHGLR DQQXDOH LQGLSHQGHQWHPHQWH GDOOD QXPHUR GL PHVL GL GDWL DFTXLVLWL

,O FDOFROR DVVXPH VLJQLILFDWR VROR VH SHU RJQL PHVH DFTXLVLWL 0HT PDJJLRUH GL DOPHQR LO

*5$),&2 5LSRUWD JOL DQGDPHQWL GHOOD YHORFLWj PHGLD PHQVLOH TXDGUDWLFR PHGLR GHOOD YHORFLWj QHL GLYHUVL PHVL VXGGLYLVR LQ VHWWRUL GL FLDVFXQR 1RUG FRQVLGHUDUH SRVLWLYR LO VHQVR RUDULR

*5$),&2 ,QGLFD OD GLVWULEX]LRQH GHOO HQHUJLD :K SHU FLDVFXQD GHOOH GLUH]LRQL / DQJROR JLUR q VWDWR FVXGGLYLVR $OO DQJROR FRUULVSRQGH LO 1RUG H DL SHU FRUULVSRQGH O (VW HFF

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*5$),&2 5LSRUWD JOL DQGDPHQWL GHOOD PHGLD GHOOD YHORFLWj QHOO DUFR GHOOH RUH GHO JLRUQR ULSRUWDWD OD PHGLD GHL YDORUL UHODWLYL FRUULVSRQGHQWH

*5$),&2 5LSRUWD O LVWRJUDPPD GHOOD SRWHQ]D VSHFLILFD RUH GHO JLRUQR SHU RJQL LQWHUYDOOR GL PLQXWL SRWHQ]H ULOHYDWH QHL GLYHUVL RUDUL LQ HYLGHQ]D OD FDPSLRQDWXUD VRUVD HROLFD

7$%(//$ ' 6RQR ULSRUWDWL SDUDPHWUL VWDWLVWLFL GHILQLWD FRPH UDSSRUWR SHUFHQWXDOH GHO YHQWR ULOHYDWR FRQ FRUULVSRQGHQWH YDORUH PH

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,O YDORUH GL WXUEROHQ]D YLHQH FDOFRODWR P V LQ WDEHOOD L SDUDPHWUL VRQR VHWWRUL GL GLUH]LRQH R FODVVH

FRQ HQ VHWWRUH GL GLUH]LRQH R FODVVH GL YHORFLWj

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FRQ HQ QXPHUR GL RFFRUUHQ]H R QHOOD FODVVH

FRQ HQ WXUEROHQ]D GHO VHWWRUH R QHOOD FODVVH

FRQ HQ VFDUWR TXDGUDWLFR

FRQ ORQ YDORUH SHU7E HQWLOH VHWWRUH R QHOOD FODVVH
XQ YDORUH PLQLPR GL WXUEROHQ]D FKH GHO VXSHUDW

FRQ ORQ YDORUH SHUFHQ7E WLOH GHO VHWWRUH R QHOOD F
UDSSUHVHQWD XQ YDORUH PDVVLPR G
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/D SULPD ULJD 7RWDOH UDSSUHVHQWD L SDUDPHWUL GHOOD
YHORFLWj GHO YHQWR VXSHULRUL DOOD YHORFLWj PLQLPD
FRQWUDVVHJQDWD GD SDUDPHWUL GHOOD WXUEROHQ]D
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,Q TXHVWR 7RWDOH QRQ YHQJRQR TXLQGL FRQVLGHUDWH
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*5$),&2 5LSRUWD O LVWRJUDPPD GHOOD GLVWULEX]LRQH GHOOD
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1HO JUDILFR VRQR ULSRUWDWL FKH OD VSHUDQ]D
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,O YDORUH GHO UDSSRUWR GL UDIILFD
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FRQ ORQ UDSSRUWR GL UDIILFD PHGLR QHO VHWWRUH R QHOOD FODVVH
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/D SULPD ULJD 7RWDOH UDSSUHVHQWD OD IUHTXHQ]D GL
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,Q TXHVWR 7RWDOH QRQ YHQJRQR TXLQGL FRQVLGHUDWH
TXHOOH LQ FXL O¶DHURJHQHUDWRUH QRQ SURGXFH HQHUJLD
GHOOD GLVWULEX]LRQH GL ZHLEXOO SHU FDUDWWHUL]]DUH

*5$),&2 5LSRUWD O LVWRJUDPPD GHOOD GLVWULEX]LRQH GHOOD YHORFLWj GH
QHOO LQWHUYDOOR GL GLHFL PLQXWL H OD FRUULVSRQGHQ

1HO JUDILFR VRQR ULSRUWDWH FKH OD VSHFLILFD GL
GLVWULEX]LRQH GL IUHTXHQ]D H OD FXUYD GL ZHLEXOO
OH VROH YHORFLWj GHO YHQWR VXSHULRUL D TXHOOD GL

7$%(//$ * 6RQR ULSRUWDWL SDUDPHWUL VWDWLVWLFL GHOOD YHORFLWj
GLUH]LRQH GHO YHQWR PLVXUDWL SHU FODVVL GL VHWWRUH
WXUEROHQ]D GHOOD GLUH]LRQH GHO YHQWR
,O YDORUH GHOOR VFDUWR TXDGUDWLFR PHGLR GHOOD GL
FRQVLGHUDWR VROR SHU YHORFLWj PHGLH QHL GLHFL PLQXWL
VWDWLVWLFL GHOOD GLUH]LRQH VRQR VWDWL VHSDUDWDPHQWH SHU
FODVVL GL YHORFLWj

FRQ QRQ VHWWRUH GL GLUH]LRQH R FODVVH GL YHORFLWj

FRQ QRQ SHUFHQWXDOH GL RFFRUUHQ]D QHO VHWWRUH R

FRQ QRQ QXPHUR GL RFFRUUHQ]H QHO VHWWRUH R QHOOD FODVVH

FRQ QRQ PHGLD GHOOD YDULDELOH QHO VHWWRUH R QHOOD

FRQ QRQ VFDUWR TXDGUDWLFR PHGLR GHOOD YDULDELOH
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$OOHJDWR DOOD 7 5HO 93(±6., 6 U O ± $FFHWWD]LRQH FRPPLWWHQWH GHO

/D SULPD ULJD 7RWDOH UDSSUHVHQWD DVFLVVH LO YDORUH PHGLR GHOOD GLUH]LRQH SHU WXWWDWH YDOLGH RVVHUYDWH FROOHWWLYDPHQWH PHQWUH OD VHFRQGD ULJD 7RWDOH FRQWLHQH GDWL SDUDPHWULFL GL GLVWULEX]LRQH GHOOD YDULDELOH GL VWDWR

,Q TXHVWR 7RWDOH QRQ YHQJRQR TXLQGL LQFOXVH OH FDOPH TXHOOH LQ FXL O¶DHURJHQHUDWRUH QRQ SURGXFH HQHUJLD GHOOD GLVWULEX]LRQH GHOOR VFDQWR TXDGUDWLFR FKH DQGUHEEH DG LQWHUHVVDUH O¶DHURJHQHUDWRUH

*5$),&2 5LSRUWD O LVWRJUDPPD GHOOD GLVWULEX]LRQH GHOOH YHORFLWj GHO YHQWR R WXUEROHQ]D QHOOH DQQXDOH GL GLHFL PLQXWL FXUYD GL GXUDWD VSHULPHQWDOH

1HO JUDILFR VRQR ULSRUWDWH DQFKH OH GLVWULEX]LRQH GL IUHTXHQ]D H OD FXUYD GL GXUDWD GHOOH VROH YHORFLWj GHO YHQWR VXSHULRUL DOOD VRJOLD GL DYYLR

7$%(//$ + 6RQR ULSRUWDWL L SDUDPHWUL FDUDWWHULVWLFL SHU FLDVFXQR GHL PHVL GHOO¶DQQR ,Q SDUWLFRODUH VRQR ULSRUWDWL

FRORQQD QRPH GHO PHVH

FRORQQD QXPHUR GL PHVL HTXLYDOHQWL DO WRWDOH GL GDWL DFTXLVLWL HQWUR TXHO PHVH D WRWDOH GL GDWL DWWHVL QHO SHULRGR GL TXHO

FRORQQD QXPHUR GL ULOLHYL UHJLVWUDWL

FRORQQD WHPSHUDWXUD PLQLPD

FRORQQD WHPSHUDWXUD PHGLD

FRORQQD WHPSHUDWXUD PDVVLPD

'DL GDWL PHGL PHQVLOL VRQR SRL FDOFRODWL L YDORUL PHGL FRORQQ

*5$),&, 5LSRUWDQR O DQGDPHQWR GHOOD WHPSHUDWXUD PLQLPD PDVVLPD H PHGLD GHOO¶DQQR H QHOO¶DUFR GHOOH RUH GHO JLRUQR

67$=,21($1(020(75,&$ 5,)(5,0(172 5HJLRQH %DVLOLFDWD &RG 5,) B

3HULRGR GL HODERUD]LRQH JLRUQL QXPHUR

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67$=,21($1(020(75,&$ 5,)(5,0(172JLRQ5H %DVLOLFDWD &RG 5,) B <
3HULRGR GL HODERUD]LRQH JLRUQL QXPHUR
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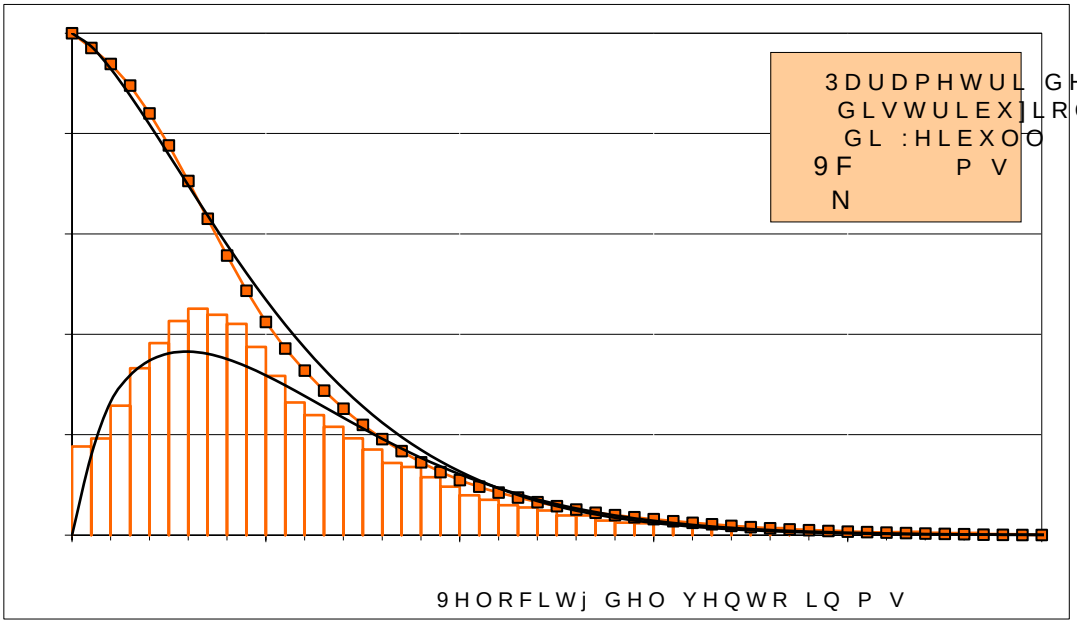

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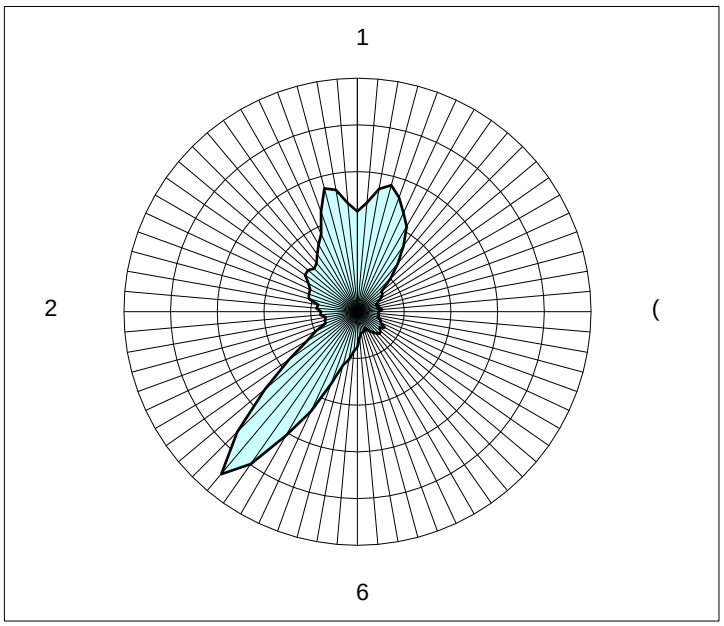

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3HUFHQWXDOH GDWL GLVSRQLELOL GDWL V
9HORFLWD GHO YHQWR 9 LQ P V ULOHYDWD D P GDO V

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9HORFLWD GHO YHQWR 9 LQ P V ULOHYDWD D P GDO V

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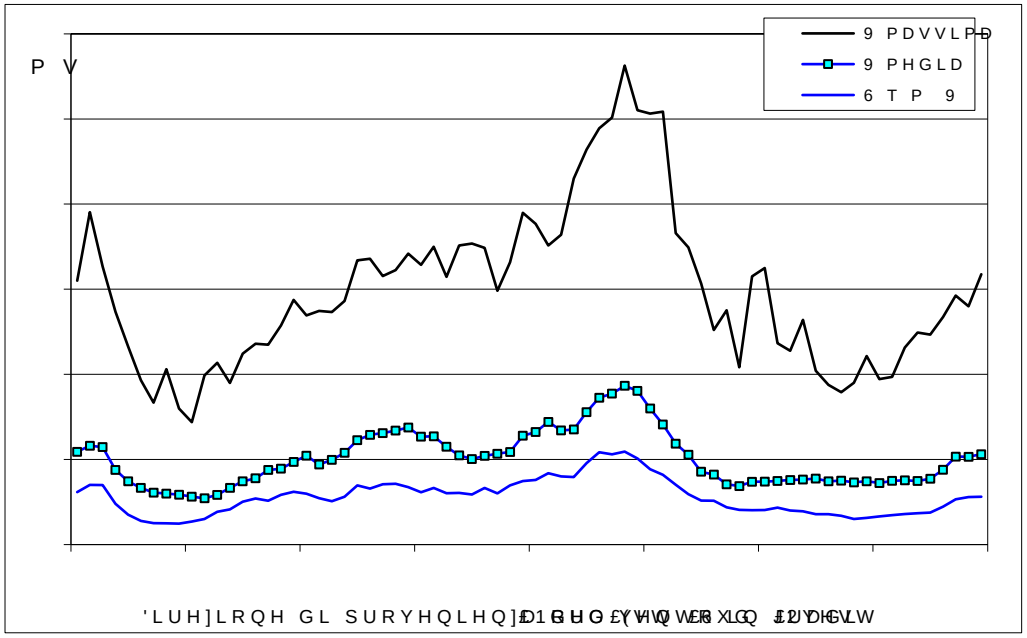

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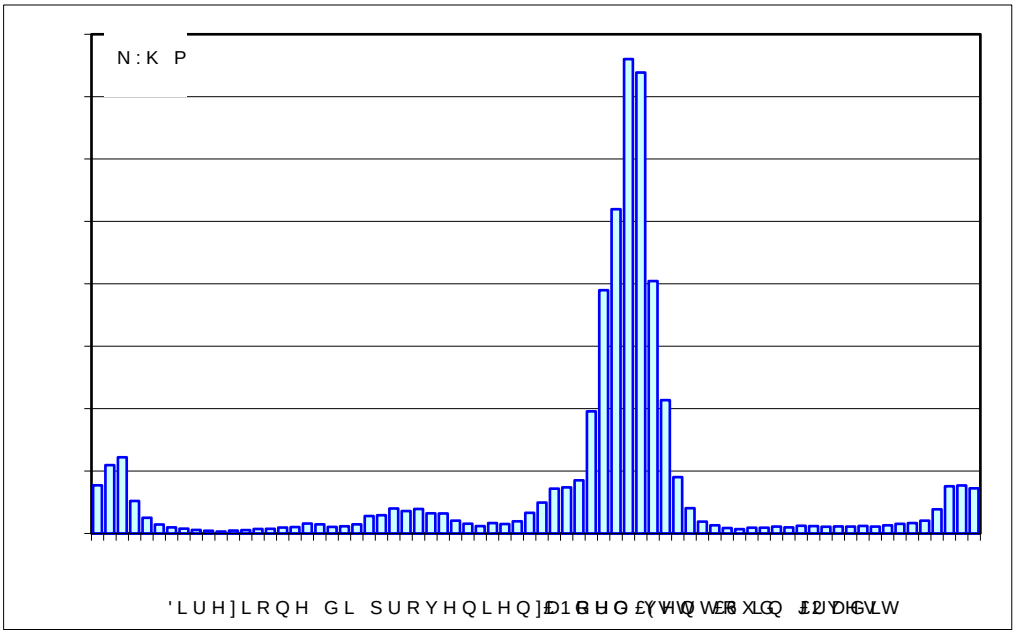

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3HUFHQWXDOH GDWL GLVSRQLELOL GDWL V
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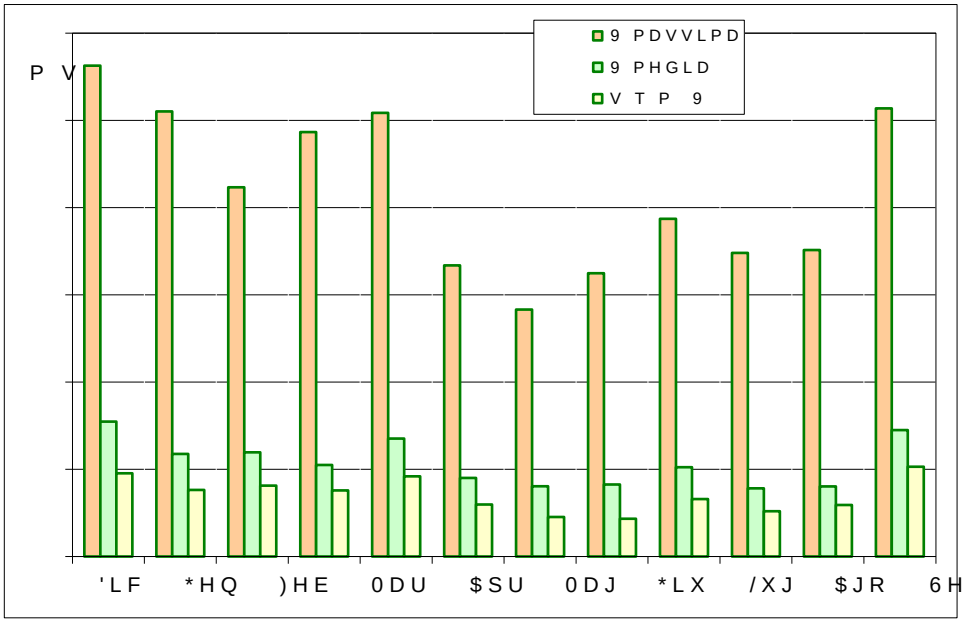

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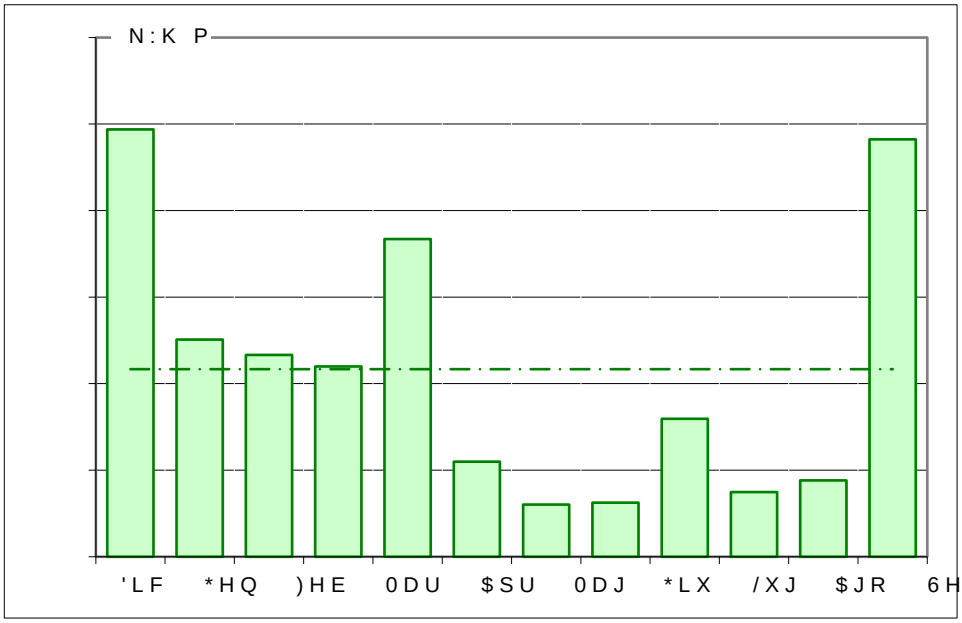

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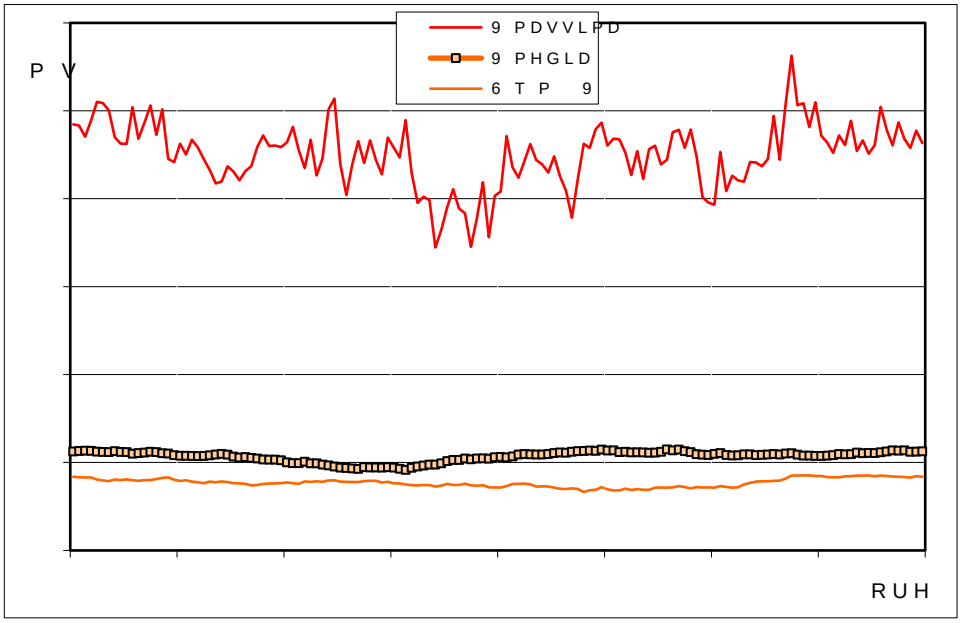

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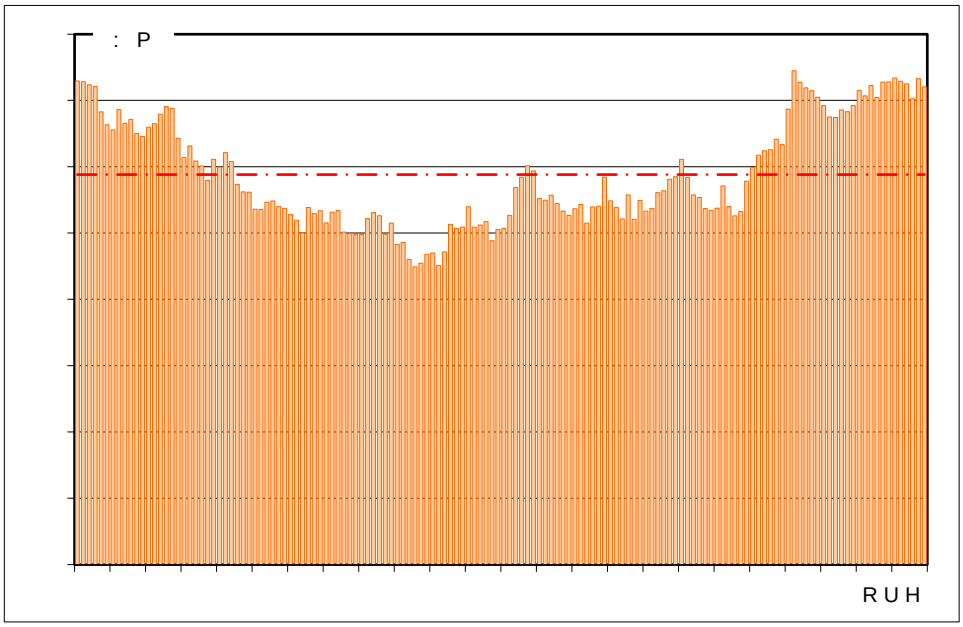

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3HULRGR GL HODERUD]LRQH JLRUQL QXPHUR
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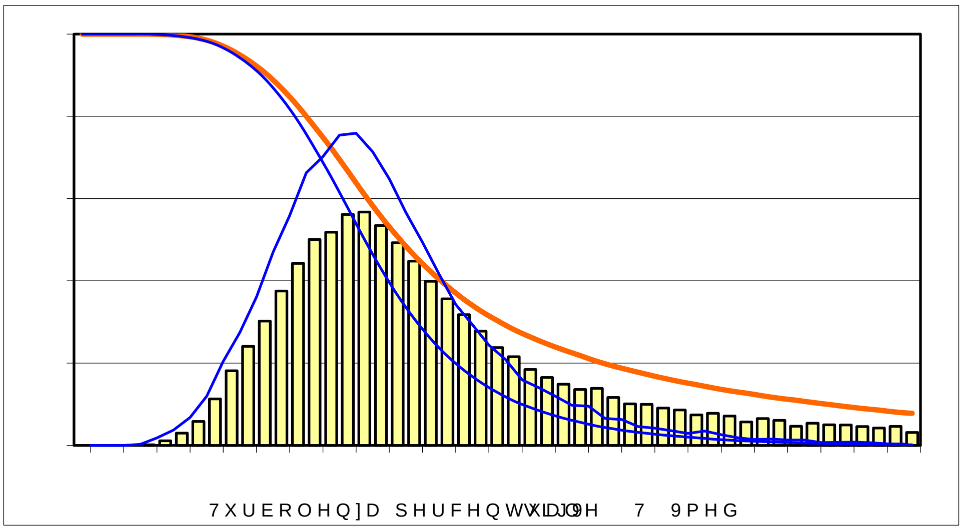

7DEHOOD ' H *UDILFR

67$=,21($1(020(75,&$ 5,)(5,0(172 JLRQR 5H %DVLOLFDWD &RG 5,) B <

3HULRGR GL HODERUD]LRQH JLRUQL QXPHUR

3HUFHQWXDOH GDWL GLVSRQLELOL GDWL V

9HORFLWD GHO YHQWR 9 LQ P V ULOHYDWD D P GDO V

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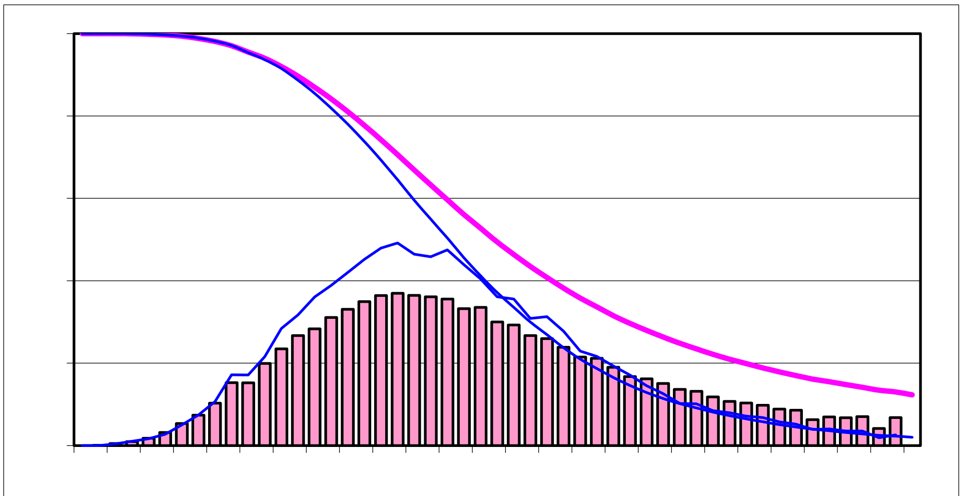

7DEHOOD (H *UDIILFR