Country   Germany

<u>***Trait category:***</u>   <u>***Individual trait(s):***</u>

Reproduction-calving   **Calving performance (direct, maternal)**
                                  Stillbirth (direct, maternal)
Reproduction-fertility   **Non-return rate 90 (female, male)**
Health   **Somatic cell count**
Workability   **Milking speed**
Conformation   **Udder**
                                  Locomotion
                                  Other
Longevity   **Stayability**

Coordination:
Arbeitsgemeinschaft Deutscher Rinderzüchter E.V. (A.D.R.)
Adenauerallee 174
D-53113 Bonn, Germany
Telephone   +49 228 91447 0
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Addresses of the different co-operatives responsible for evaluation and publication for different breeds/traits:

All evaluation for Holstein Friesian and German Red & White, except for stayability, milking speed and beef & growth traits:
Vereinigte Informationssysteme Tierhaltung w.V. (VIT Verden)
Heideweg 1
D-27283 Verden, Germany
Telephone   +49 4231 955 - 171 or 173
Facsimile   +49 4231 955 - 166
E-mail   vitall@rzv-srv.vit.de

All breeds restricted to Schleswig-Holstein for somatic cell count and stayability:
LKV Schleswig-Holstein
Steenbeker Weg 151
D-24106 Kiel, Germany
Telephone   +49 431 339870
Facsimile   +49 431 3398713

All breeds restricted to Rheinland-Pfalz and Saarland for milking speed:
Landesanstalt für Tierzucht und Qualitätsprüfungen Neumühle
D-67728 Münchweiler/Alsenz, Germany
Telephone   +49 6302 92160
Facsimile   +49 6302 921699

All breeds restricted to Bavaria for somatic cell count and beef & growth traits:
Landeskuratorium der Erzeugerringe für Tierische Veredlung
Haydnstr. 11
D-80336 München, Germany
Telephone   +49 89 5443480
Facsimile   +49 89 54434810

All breeds restricted to Bavaria, except for somatic cell count and beef & growth traits:
Bayerische Landesanstalt für Tierzucht
Prof. Dürrwaechter-Platz 1
D-85586 Poing, Germany
Telephone   +49 89 99141 300
Facsimile   +49 89 99141 105

All breeds restricted to Baden-Württemberg:
Landesamt für Flurneuordnung und Landesentwicklung
EB21
D-70806 Kornwestheim
Telephone   +49 7154 139368
Facsimile   +49 7154 139499

Reproduction calving traits	Calving performance (direct, maternal) Stillbirth (direct, maternal)	
Breed(s)	[V]	Verden: Holstein Friesian, German Red & White
	[B]	Bavaria: Fleckvieh, Braunvieh, Gelbvieh
Trait definition and unit(s) of measuring	[V]	Calving performance is scored in 3 categories; normal or easy (1), hard pull (2), veterinary help or caesarian (3) Stillbirth is defined as stillborn or died within 24 hours after birth
	[B]	Calving performance is scored in 5 categories; without help (0), one helper (1), two or more helpers or mechanical help (3), veterinary help (4), caesarian section (5) Stillbirth is defined as stillborn or died within 48 hours after birth
Method of measuring and collecting data	[V,B]	Scored by farmer and collected by milk recording system
Time period for data inclusion	[V]	Since 1986
	[B]	Since 1979
Age groups	[V,B]	All
Genetic parameters	[V,B]	$h^2_{\text{calving performance (direct)}} = 0.05$ $h^2_{\text{calving performance (maternal)}} = 0.05$ $r_{g(\text{calving performance (direct, maternal)})} = -0.10$ $h^2_{\text{stillbirth (direct)}} = 0.05$ $h^2_{\text{stillbirth (maternal)}} = 0.05$ $r_{g(\text{stillbirth (direct, maternal)})} = -0.10$
Sire categories	[V,B]	All bulls
Environmental effects pre-adjustment	[V,B]	None
evaluation model	[V,B]	Herd x calving year, calving month, parity, age within parity, sex of calf, permanent cow effect
Base for age adjustment	[V,B]	None
Use of genetic groups and/or relationships	[V,B]	AM with genetic "phantom" groups for unknown parents
Method (model) of genetic evaluation	[V,B]	Maternal effects ST BLUP AM for repeated records
System validation	[V,B]	Plausibility checks of recorded data, check on model suitability (fixed effects, EBV), genetic trend
Expression of proof	[V,B]	RBV-C standardized with M = 100 and SD = 12, higher values are more desirable
Genetic (reference) base	[V,B]	All cows born 1990 within breed
Criteria for official publication of sire proofs	[V]	REL > 0.50
	[B]	≥ 10 daughters in ≥ 5 farms for milk production

Reproduction calving traits *continued*		Calving performance (direct, maternal) Stillbirth (direct, maternal)
Number of evaluations/ publications per year	[V] [B]	One; August Two; May, November
Use in total merit index	[V,B]	Development of selection index in progress
Key reference on methodology applied	[V,B]	Gierdziewicz, M. et al., 1994. 45th Meeting of EAAP, Edinburgh.Evaluation of calving ease using a reduced animal model in German Fleckvieh Averdunk, G. et al., 1995. Proc. of the open session of the Interbull annual meeting Prague. Sire evaluation for fertility and calving ease in Germany

Reproduction fertility traits	Non-return rate 90 (female, male)	
Breed(s)	[V]	Verden: Holstein Friesian, German Red & White
	[B]	Bavaria: Fleckvieh, Braunvieh, Gelbvieh
	[W]	Baden-Württemberg: Fleckvieh, Braunvieh, Vorderwälder, Schwarzbunt, Rotbunt
Trait definition and unit(s) of measuring	[V,B,W]	Percentage non-returns within 90 days after first insemination
Method of measuring and collecting data	[V]	Collected by AI-service technicians, veterinarians and milk recording system
	[B,W]	Collected by AI-organizations
Time period for data inclusion	[V,B]	Since 1986
	[W]	Since 1980
Age groups	[V,B,W]	All
Genetic parameters	[V,B,W]	$h^2_{\text{non-return rate 90 (female)}} = 0.02$ $h^2_{\text{non-return rate 90 (male)}} = 0.02$ $r_{g(\text{non-return rate 90 (female, male)})} = -0.05$
Sire categories	[V,B,W]	All bulls
Environmental effects pre-adjustment evaluation model	 [V,B,W] [V,B,W]	 None Herd x year, calving month, parity, age within parity (only heifers), interval between calving and 1st insemination (only cows), permanent cow effect
Base for age adjustment	[V,B,W]	None
Use of genetic groups and/or relationships	[V,B,W]	AM with genetic "phantom" groups for unknown parents
Method (model) of genetic evaluation	[V,B,W]	ST BLUP AM, including paternal and maternal genetic effects
System validation	[V,B,W]	Plausibility checks of recorded data, checks on model suitability for fixed effects and breeding value
Expression of proof	[V,B,W]	RBV-F standardized with M = 100 and SD = 12, higher values are more desirable
Genetic (reference) base	[V,B]	All cows born in 1990 within breed
	[W]	Fixed, sires born in 1982-1984
Criteria for official publication of sire proofs	[V]	REL > 0.50
	[B]	≥ 10 daughters in ≥ 5 herds for milk production
	[W]	≥ 200 insemination and ≥ 50 daughters inseminations
Number of evaluations/ publications per year	[V]	One; August
	[B]	Two; May, November
Use in total merit index	[V,B]	Development of selection index in progress

Reproduction fertility traits *continued*	Non-return rate 90 (female, male)

| Key reference on
methodology applied | [V,B] | Thaller, G et al., 1994. 45th Meeting of EAAP, Edinburgh. Breeding value estimation for reproductive traits by an animal model with paternal and maternal effects
Averdunk, G. et al., 1995. Proc. of the open session of the Interbull annual meeting Prague. Sire evaluation for fertility and calving ease in Germany |

Health traits	Somatic cell count	
Breed(s)	[V]	Verden: Holstein Friesian, German Red & White
	[B]	Bavaria: Fleckvieh, Braunvieh, Gelbvieh, Holstein Friesian
	[S]	Schleswig Holstein: Holstein Friesian, German Red & White, Red Angler
Trait definition and unit(s) of measuring	[V]	Somatic cell score is log 2 transformed test-day somatic cell counts, taken between 4 and 365 days in lactation; number of cells should be between 5,000 and 6,400.000
	[B]	Log 10 transformed somatic cell counts (in 1000/ml); number of cells should be between 10,000 and 10,000,000
	[S]	Lactation mean of log transformed test-day somatic cell count, taken between 2nd and 8th milk recording
Method of measuring and collecting data	[V,B]	Test-day results from milkrecording
	[S]	Collected during normal milk recording
Time period for data inclusion	[V]	Since 1990
	[B]	Since 1989
	[S]	Since 1986
Age groups	[V]	1st to 3rd lactation
	[B]	1st lactation
	[S]	All
Genetic parameters	[V]	$h^2_{\text{somatic cell score (lactation 1)}} = 0.08$ $h^2_{\text{somatic cell score (lactation 2)}} = 0.13$ $h^2_{\text{somatic cell score (lactation 3)}} = 0.14$ $r_{g(\text{somatic cell score (lactation 1, lactation 2)})} = 0.90$ $r_{g(\text{somatic cell score (lactation 1, lactation 3)})} = 0.85$ $r_{g(\text{somatic cell score (lactation 2, lactation 3)})} = 0.97$
	[B]	$h^2_{\text{somatic cell count (for Fleckvieh and Gelbvieh)}} = 0.05$ $h^2_{\text{somatic cell count (for Braunvieh and Holstein Friesian)}} = 0.07$
	[S]	$h^2_{\text{somatic cell count}} = 0.10$
Sire categories	[V,S]	All bulls
	[B]	Bulls with ≥ 10 daughters
Environmental effects pre-adjustment evaluation model	[V,B,S]	None
	[V]	Region, age of calving, stage of lactation, season of calving, herd x test-date, permanent environment
	[B]	Herd x year, month, stage of lactation, cow
	[S]	Herd x year, parity
Base for age adjustment	[V,B,S]	None
Use of genetic groups and/or relationships	[V]	All known relations in an AM. Phantom parent groups according to selection path, breed, year of birth
	[B]	None
	[S]	Bull's birth year

Health traits *continued*		Somatic cell count
Method (model) of genetic evaluation	[V]	MT BLUP AM for test-day records. Lactation 1, 2 and 3 are considered as separate traits
	[B,S]	ST BLUP Sire repeatability model
System validation	[V]	Edits for age of calving and days in milk
	[B]	Checks similar to milk recorded data
	[S]	Plausibility checks of recorded data
Expression of proof	[V]	Combined RBV = 0.26 x $scs_{lactation\ 1}$ + 0.37 x $scs_{lactation\ 2}$ + 0.37 x $scs_{lactation\ 3}$, with M = 100 and SD = 12, higher values are more desirable
	[B,S]	RBV standardized with M = 100 and SD = 12, higher values are more desirable
Genetic (reference) base	[V]	Rolling bull base, defined by all 8-10 year old AI-bulls
	[B]	All test bulls tested in the latest 3 year period for milk production
	[S]	Rolling bull base
Criteria for official publication of sire proofs	[V,B,S]	REL ≥ 50 %
Number of evaluations/ publications per year	[V]	Two; March, September
	[B]	Two; April, October
	[S]	One; August
Use in total merit index	[V,B,S]	No
Key reference on methodology applied	[V]	Reents, R., J. Jamrozik, L.R. Schaeffer & J.C.M. Dekkers, 1995. Estimation of genetic parameters for test-day records of somatic cell score. J. Dairy Sci. 78: 2847 Reents, R., J.C.M. Dekkers & L.R. Schaeffer, 1995. Genetic evaluation for somatic cell score with a test-day model for multiple lactations. J. Dairy Sci. 78: 2858

Workability traits	Milking speed	
Breed(s)	[B]	Bavaria: Fleckvieh, Braunvieh, Gelbvieh
	[R]	Rheinland-Pfalz and Saarland: Holstein Friesian, German Red & White, Red Angler
	[W]	Baden-Württemberg: Fleckvieh, Braunvieh, Vorderwälder, Schwarz & Rotbunt
Trait definition and unit(s) of measuring	[B,W]	Average milking speed (in kg/minute)
	[R]	Average milking speed measured between 50th and 180th day during first lactation (in kg/minute)
Method of measuring and collecting data	[B]	Included in milk recording scheme
	[R,W]	Collected during normal milk recording
Time period for data inclusion	[B]	Since 1970
	[R]	Since 1976
	[W]	Since 1981
Age groups	[B,R,W]	1st lactation
Genetic parameters	[B,R]	$h^2_{milking\ speed} = 0.20$
	[W]	$h^2_{milking\ speed} = 0.30$
Sire categories	[B,W]	Test bulls
	[R]	All bulls with progeny records
Environmental effects		
pre-adjustment	[B]	Test-day milk yield
	[R]	Test-day within lactation, herd, year
	[W]	Day of lactation
evaluation model	[B]	Technician doing the proof
	[R]	None
Base for age adjustment	[B,R,W]	None
Use of genetic groups and/or relationships	[B,R]	None
	[W]	Birth year of sire
Method (model) of genetic evaluation	[B,W]	ST CC-procedure
	[R]	ST SM
System validation	[B]	Plausible checks of recorded data
	[R]	Check for extreme values (excess, kurtosis)
	[W]	-
Expression of proof	[B,R,W]	EBV in kg milk per minute
Genetic (reference) base	[R]	All bulls proved within the last 5 years
	[W]	Bulls born 1982-1984
Criteria for official publication of sire proofs	[B,R]	≥ 20 daughters
	[W]	≥ 20 daughters (for Fleckvieh) ≥ 10 daughters (for other breeds)
Number of evaluations/ publications per year	[B]	Four; February, May, August, November
	[R]	Two; June, December
Use in total merit index	[B]	Development of selection index in progress
	[R,W]	No
Key reference on methodology applied	[B,R,W]	-

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Conformation traits	Udder:	fore udder attachment, fore udder length, rear udder height, suspensory ligament, udder depth, teat placement, teat length, udder overall
	Locomotion:	rear leg set, foot angle
	Other:	stature, body depth, rump angle, rump width, strength, dairy character, body type overall

Breed(s)	[V]	Verden: Holstein Friesian, German Red & White, Angler
	[B]	Bavaria: Fleckvieh, Braunvieh, Gelbvieh
	[W]	Baden-Württemberg: Fleckvieh, Braunvieh, Vorderwälder, Schwarz & Rotbunt
Trait definition and unit(s) of measuring	[V]	Most individual traits scored on a linear 1-9 point scale, following recommendation of the European and World-wide group for harmonization of linear type classification, except for stature, which is measured in cm Overall traits are scored on a 0-50 point scale
Method of measuring and collecting data	[V]	Scored by classifier
	[B,W]	Scored by official people
Time period for data inclusion	[V]	Since 1984
	[B,W]	New scoring system since 1988
Age groups	[V,B,W]	1st lactation
Genetic parameters	[V]	$h^2_{udder\ traits} = 0.18$ to 0.27 $h^2_{locomotion\ traits} = 0.13$ $h^2_{other\ traits} = 0.21$ to 0.43
Sire categories	[V]	All bulls
	[B]	Promising AI-sires, since 1993 all AI-sires
	[W]	Promising AI-sires
Environmental effects		
pre-adjustment	[V]	Heterogeneous variances between classifiers
	[B,W]	None
evaluation model	[V]	Classifier x year, herd x year, stage of lactation, age of calving
	[B]	Classifier
	[W]	Time x region x person
Base for age adjustment	[V,B,W]	None
Use of genetic groups and/or relationships	[V]	All known relations in an Animal model. Phantom parent groups according to selection path, breed, year of birth
	[B,W]	None
Method (model) of genetic evaluation	[V]	ST BLUP AM
	[B]	ST deviation of average of classifier
	[W]	CC-procedure

Conformation traits *continued*	Udder Locomotion Other	
System validation	[V]	Check for reasonable age of calving and stage of lactation at time of classification, only 1st lactation 1st classification are used
	[B,W]	None
Expression of proof	[V]	EBV standardized with M = 100 and SD = 12
	[B]	RBV with M = 100 and SD = 12, higher values are more desirable
	[W]	EBV
Genetic (reference) base	[V]	Rolling bull base, defined by all 8-10 year old AI-bulls
	[B]	None
Criteria for official publication of sire proofs	[V]	≥ 20 daughters in 5 herds
	[B]	≥ 30 daughters
	[W]	≥ 20 daughters
Number of evaluations/ publications per year	[V]	Two; March, September
	[B]	Four; February, May, August, November
Use in total merit index	[V,R,B]	No
Key reference on methodology applied	[V,B]	Reents, R, 1993. Estimation of breeding values for type traits in Germany, Interbull Bulletin No. 8, 1993

Longevity traits	Stayability	
Breed(s)	[B]	Bavaria: Fleckvieh, Braunvieh, Gelbvieh
	[S]	Schleswig Holstein: Holstein Friesian, German Red & White, Red Angler
	[W]	Baden-Württemberg: Fleckvieh, Braunvieh, Vorderwälder, Schwarz & Rotbunt
Trait definition and unit(s) of measuring	[B]	Relative risk for culling
	[S,W]	Percentage of live daughters at the age of 46 and 60 months
Method of measuring and collecting data	[B]	Included in milk recording scheme
	[S]	Birth and culling date of cows recorded during normal milk recording
	[W]	Birth dates of all cows
Time period for data inclusion	[B]	Since 1976
	[S]	Since 1979
	[W]	Since 1971
Age groups	[B,S,W]	All
Genetic parameters	[B]	$h^2_{stayability} = 0.1$
	[S]	$h^2_{stayability} = 0.05$
	[W]	$h^2_{stayability} = 0.07$ to 0.12 (different h^2 for different breeds)
Sire categories	[B,S,W]	All bulls

Environmental effects
  pre-adjustment
  evaluation model
	[B,S,W]	None

	[S]	Herd, year x season, age of first calving
	[W]	Herd, first calving age group, genetic group
Base for age adjustment	[B,S,W]	None
Use of genetic groups and/or relationships	[B]	Full relationship matrix, animals with unknown parents are grouped by birth year
	[S]	Bull's birth year
	[W]	Birth year of sire of semen
Method (model) of genetic evaluation	[B,S,W]	ST BLUP SM
System validation	[B,W]	-
	[S]	Plausibility checks of recorded data
Expression of proof	[S]	RBV standardized with M = 100 and SD = 12, higher values are more desirable
	[W]	EBV
Genetic (reference) base	[B]	Rolling bull base, i.e. in 1996 average of 1986 to 1988 was used
	[S]	Rolling bull base, i.e. in 1996 average of 1983 to 1986 was used
	[W]	Bulls born between 1975-1977
Criteria for official publication of sire proofs	[S]	REL > 50%
	[W]	≥ 50 daughters (for Fleckvieh) ≥ 30 daughters (for other breeds)

Longevity traits *continued*	Stayability	
Number of evaluations/ publications per year	[B] [S]	Two; May, November One; August
Use in total merit index	[B,S,W]	No
Key reference on methodology applied	[B,S,W]	-